MODEL AIRPLANE NEWS

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Floatplane Buyer's Guide

How To: Fuel Tanks

Helicopter Forward Flight

High-Performance Fiesta Glider

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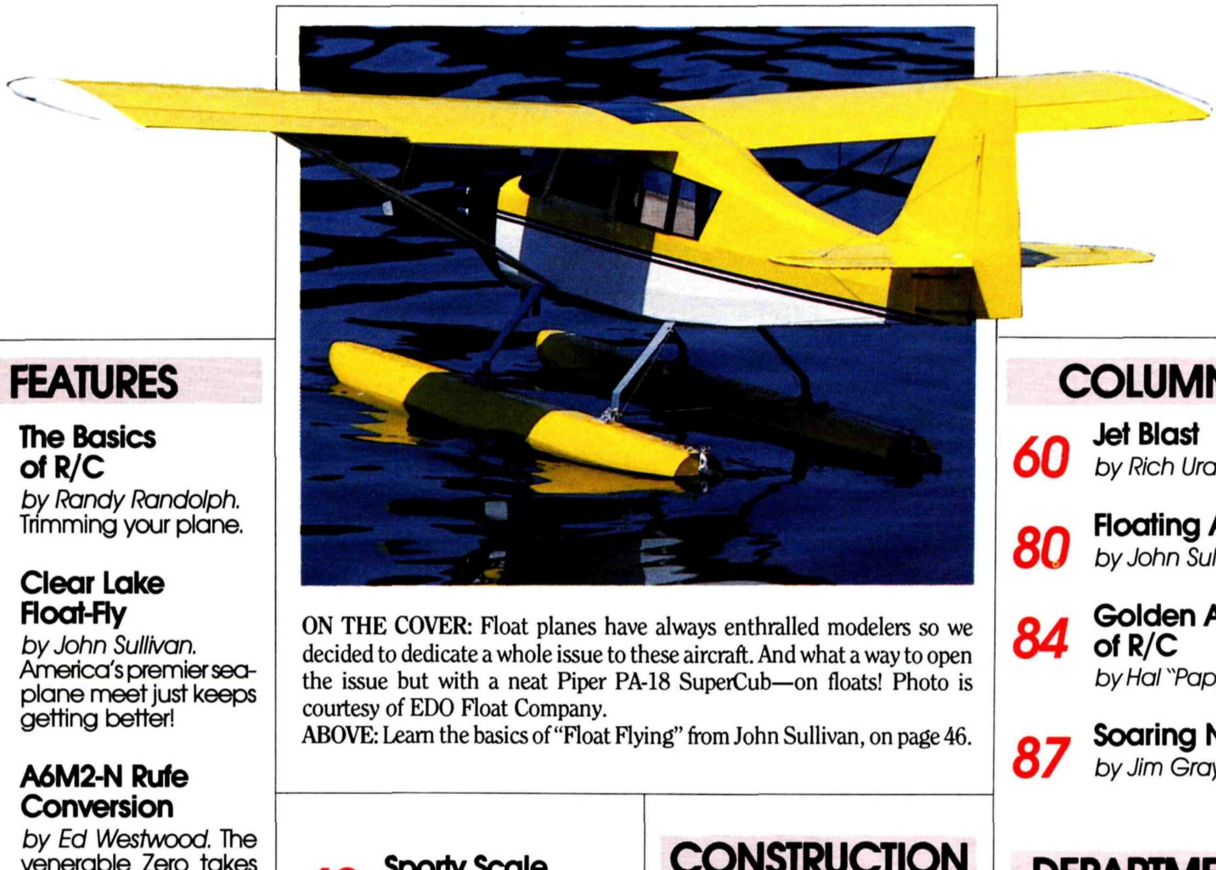
MODEL AIRPLANE NEWS



ON THE COVER: Float planes have always enthralled modelers so we decided to dedicate a whole issue to these aircraft. And what a way to open the issue but with a neat Piper PA-18 SuperCub—on floats! Photo is courtesy of EDO Float Company.
ABOVE: Learn the basics of "Float Flying" from John Sullivan, on page 46.

FEATURES

CONSTRUCTION

COLUMNS

COLUMNS

DEPARTMENTS

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Publisher
DR. LOUIS V. DeFRANCESCO

Associate Publisher
YVONNE M. MICIK

Editor-in-Chief/Associate Publisher
LOUIS V. DeFRANCESCO JR.

Executive Editor
CHRIS CHIANELLI

Associate Editor
RICHARD URAVITCH

Managing Editor
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Editorial

by RICH URAVITCH

WHEN WE RECOGNIZE that three-quarters of our planet's surface is water, and 80% of active R/C aeromodelers are sport fliers, it makes you kind of wonder why there's a flying site problem at all!

Obviously, the more "visionary" types among you had long ago foreseen the impending problem and had taken to the waterways. According to some of you, your models haven't had wheels on the axles since you first discovered that nearby lake. Sure, there are some logistics concerns, like a retrieval method, but that's not a big deal, especially when a club is involved.

I recently flew off the water for the first time, so I'm certainly not an expert. But my club, the Suffolk (New York) Wings, sponsored a contest. I showed up with my Top Flite Cub, hastily (and incorrectly) fitted with a pair of Gee Bee floats. Not having read John "Floating Around" Sullivan's guidelines for properly turning a *terra firma* airplane to aquatic, I did everything wrong; wrong size float, wrong track, wrong height, wrong incidence.... I paid the dues by dunking the Cub twice before even getting "on the step."

Borrowing a properly set-up float airplane from Chris Chianelli, my first attempt was a piece of cake. The plane handled just fine. The thrill of your first water landing is something you'll not soon forget. The throttling back on base turning final, acres of "runway" over the nose, the touchdown providing two wisps of spray, the ever-so-slight skip because you were just a skosh "hot," settling down to a full-weight taxi back to the "mooring"...brother, you have arrived!

This issue focuses on floatplane activities and we hope it will be informative, entertaining, and maybe provide the motivation to give it a try. For those of you who've been dancing your flying machines over the waterways for a long time, thanks for the pathfinding...those of us about to join you thank you. And, for those of you who read "Jet Blast," no, my next airplane will *not* be a Convair Sea Dart!

Just a brief note concerning our "Great American Airplane Design Contest," we have been literally overwhelmed! Some truly outstanding designs have been received and reviewed. The response was phenomenal with 408 different entries received by the deadline. There was no way we could feature this many designs, so we have done our pre-screening and will be presenting the finalists to you for your vote in the next issue. Incredible, absolutely incredible.... ■

Airwaves

More Small Steps

I've been a modeler since about 1941 and can't really remember how long I've subscribed to *M.A.N.* I also receive some other publications, but *M.A.N.* takes the top spot every month. With each issue you folks seem to get better and better.

In particular, I enjoy the column "Small Steps." I've been involved in pattern competition, tried big airplanes and scale, but for just plain R/C fun the planes described in "Small Steps" seem to satisfy me the most. Keep up the good work.

MAURICE TAYLOR
Ohio City, OH

Thanks, Maurice, it's always wonderful to hear that our efforts to keep Model Airplane News *on top are appreciated.*
CC

Cub Lover

I'm writing my letter in response to a letter from Don Kelton which appeared in "Four-Cycle Forum" in the March '87 issue.

Years ago, when we were testing gas model free-flights, we would set the timer for 10 seconds or so and retard the spark, thus slowing the engine and reducing the thrust. With the advent of the glowplug, this method of thrust reduction was impossible, so we put the prop on backward. This reduced thrust considerably.

I'm the owner of a third-hand Sig Cub which was reconstructed a few times by its previous owners, and now weighs a shade under 7½ pounds. I mounted a Saito .45 in it, put on larger wheels, experimented a bit with fuels and props, and now the Cub has no trouble becoming airborne. Aside from takeoff, full power really isn't necessary. The Cub doesn't leap into the air, but I didn't expect Quickie 500 performance. Loops, rolls, spins, inverted flight, etc., are all easily performed. Cruising at altitude at half throttle is a joy.

I'm using a Tornado 12x5 cut down a bit, and Red Max 10% castor oil-based fuel. I have also used 11x8, 11x7, and 11x6 Top Flite and Tornado props with varying degrees of success, dependent upon weather and temperature conditions.

Perhaps the builder of the Cub mentioned in Mr. Marez' excellent column should check various fuels, props, the CG, etc., before giving up on the Sig Cub and Saito .45 combination.

EDWARD LOWE
Holdingford, MN

Flying Clubs

I'm just getting into model aircraft and have been fortunate enough to have an experienced flier teach me how to build and fly my first plane. I learned much faster and flew more safely under his wing.

Do you have any suggestions on how to start a local flying club? I'm hooked on this sport and would like to get as many folks started as possible. I'm aware of the frustrations that can come with not knowing where to start and would like to help in my own way.

PAT HEDGLIN
Sauk Centre, MN

Starting a local flying club is an excellent idea. The AMA (Academy of Model Aeronautics) is the governing body for aeromodeling in the U.S. They can provide you with all the information required to organize your club. Good luck, and welcome to the fraternity. *RU*

Canadian Champ

Your article about the Aeronca in the March '87 issue has prompted the writing of this letter. Having had the opportunity to learn to fly in Aeronca Champs and Champion Traveler/Tri-Traveler aircraft, and being a devout Aeronca lover since the early 1960s, owning no less than three Aeroncas, I felt that two points required clarification.

The Champion Aircraft Company of Osceola, Wisconsin, manufactured both the 7EC Traveler and 7FC Traveler with the Continental 90C-12F which was rated at 95 hp at takeoff, otherwise developing 90 hp. Also, the Aeronca 7 and 11 series, and the Champion 7 series aircraft, all use the same airfoil, the Clark Y, not the NACA 4412 which was mentioned. These two airfoils are very similar, and very often confused. The Clark Y is a favorite with FF scale model builders.

I wish to compliment both authors for giving the reader an otherwise sound article, and for bringing to life memories of a very fine aircraft.

MARTIN SMYK
Winnipeg, Canada

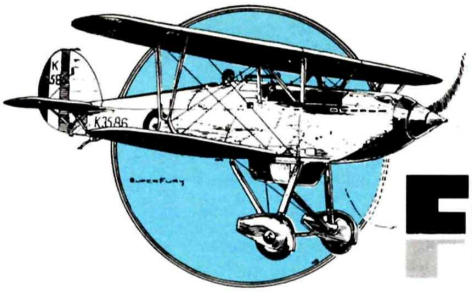
Prop Balancing

I write concerning your November 1986 issue, in which your "How to" article (page 22) shows how to make a homemade propeller balancer; but it was especially written for wooden propellers. I'd like to know if it is possible to use this balancer with glass-filled nylon propellers. Your response will be greatly appreciated.

ANTHONY M. WILKES
Collegeville, PA

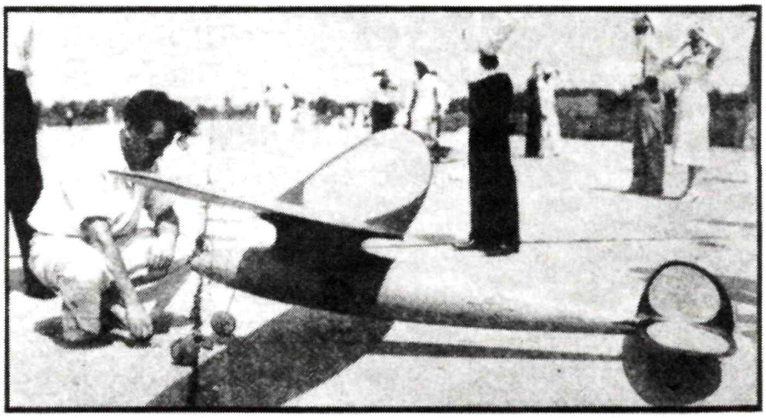
I see no reason why the balancer shown would not work as well for glass-filled nylon props. However, these props often are in pretty good balance to begin with since the density of the material is controlled better in the manufacturing process than Mother Nature is able to do with wood. I've found that minimal removal by scraping with a knife or sandpaper on the leading edge of a nylon prop is the best way to get it in balance.
AS

We welcome your comments, opinions, and suggestions. Letters should be addressed to "Airwaves," **Model Airplane News,** 632 Danbury Rd., Wilton, CT 06897. Letters may be edited for clarity and length.



Fifty Years Ago...

by ART SCHROEDER



Carl Goldberg and his super-streamlined gas model that hated to come down once airborne; model was second to Maxwell Bassett in 1937.

KITS FOR engines were big hobby items in 1937, with offerings from Bunch (Gwin Aero and Mighty Midget) and GHQ. In effect, a modeler received an engine in disassembled form and he saved $4 to $6 by putting it together. One wonders how many of these engines actually ran, certainly the stories about GHQ and its "static" qualities are lengendary.

Gas models were rapidly growing in popularity and new engine manufacturers were appearing monthly. How many remember names (all now gone) such as Chunn, Syncro-Ace, Gwin Aero, Dennymite, Trojan Jr., GHQ, Ohlsson, Brown, and Baby Cyclone? The engines were available and modelers, fifty years ago, used them to good advantage.

This was shown in a report on the 1937 Nationals held in Detroit and sponsored by the National Aeronautic Association. The famous events of that day—Mulvihill, Stout, and Moffett (all rubber-powered events)—were held along with Texaco, a ⅛-ounce fueled gas event.

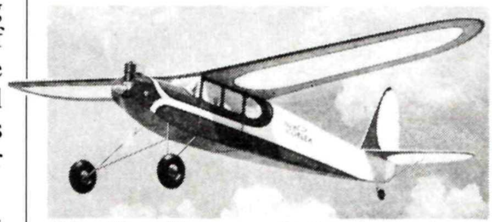
As expected, the gas event was won by Philadelphian Maxwell Bassett (he was referred to as the "father" of gas modeling, along with Bill Brown). Bassett's flight time was 70-plus minutes—for one flight. But a newcomer to gas flying, Carl Goldberg, indicated that he was going after Bassett's long-standing string of wins. Goldberg was second with a single flight of 52:45. Until that time Carl Goldberg had dominated indoor events so his change of events was stunning for modelers in 1937.

Even with all the excitement of high-flying gas models, the event which generated the most interest was the radio-controlled gas models event won by Chester Lanzo. If one wants to look at the roots of R/C today, one must only look at this 1937 event. Truly, the handwriting was on the wall!

The NAA sponsored 1937's National contest.

Lanzo's model was relatively simple and was the only one that successfully flew. Two others got off the ground but crashed soon after. It was all proof positive that great things grow from small beginnings.

Actually the most advanced airplane and control system were entered by Walt Good. It was the one that most observers felt would win. Unfortunately, lengthy preparation carried Good to the contest's conclusion and time simply ran out.



Scientific rubber-powered Flea simulated gas-model flight and was author's first real free flight.

The final result of this first R/C National contest saw Chester Lanzo as winner, with P. Sweeney, E. Wasman, Walt Good, Leo Weiss, and R. Schiffman following.

If you think cash prizes for modeling events are new in the '80s, Lanzo collected a purse of $10—quite a difference from the Tournament of Champions and Hanno Prettner's sizable winnings in Las Vegas. But Hanno and the Tournament would not have happened without the Lanzos, Goods, and Weiss; they, along with many others, pioneered the hobby/sport we all enjoy today. And *Model Airplane News* was there, observing the scene fifty years ago! ■

1937's newest Army Attack plane, the Northrop A-17 with 750 hp.

Balance and Trim

Basics of Radio Control

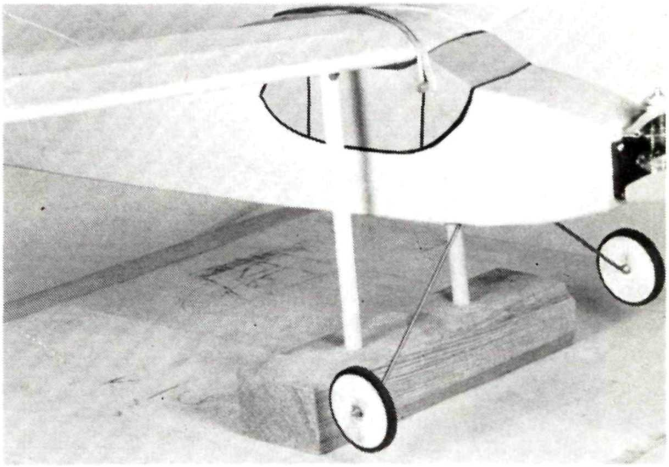
by RANDY RANDOLPH

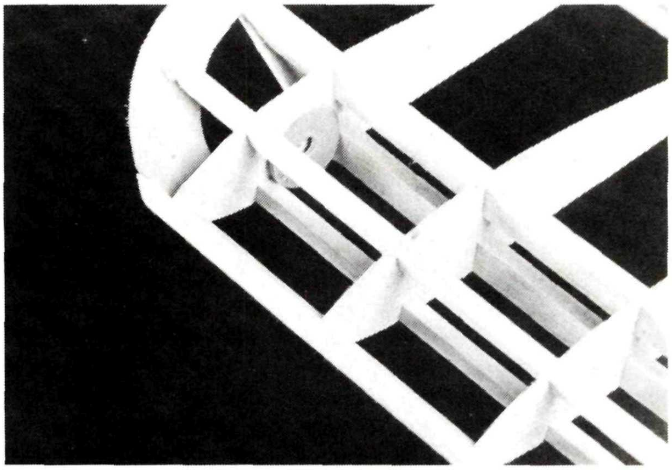
TO FLY correctly, an airplane must be in proper trim. "Trim" has different meanings for different circumstances, but in this case, it refers to a condition of the flying surfaces in which the plane will remain in a straight and level flight path without continuous control input. A properly trimmed and balanced plane is a pleasure to fly.

The first consideration is balance. The plans or instructions which come with the plane usually show a range where the balance can be found. This range is referred to as the balance point, or center of gravity (CG). The latter term is often a misnomer, but either term will suffice to locate the area for our purposes. If you don't have instructions, an area about 25% of the wing chord aft of the leading edge is a good place to start for conventional planes. Some weight must be added to the nose or tail to bring the plane into level balance at this point.

Balancing is not complete with fore and aft balance alone. Variations in the density of the construction materials, as well as the location and mounting of the engine and radio equipment, can cause wide differences in lateral (side-to-side) balance as well. Therefore, it's important to balance the plane along its centerline by adding weight to the tip of the lighter wing.

Prior to covering, the plane can be balanced and an internal weight added to a wing tip if necessary. If this practice is followed, digging into the wing to add balancing weight after it's completed won't be necessary.





Top: Simple fixture to aid proper balancing. Above: Wood differences cause unequal wing weights, which must be corrected.

Before actual flight, the airplane should be inspected for any warped flying surfaces. If any are found, they must be corrected. Applying direct heat from a heat gun or hair dryer while holding the surface straight will correct warps in heat-shrunk plastics. When all the warps are removed, center the rudder and rig the

elevator and ailerons flush with the *bottom* of the surface to which they are joined.

The initial test flight should achieve rough level flight trim, and tell whether the surface throws are adequate to maintain positive directional and elevation control. After the flight, reset the control surfaces so the transmitter trims can be returned to their near central position, and trimming can begin.

First, place the plane in level flight and adjust the elevator and aileron trims until they remain that way hands-off. Now do two or three consecutive loops in front of you, into the wind. If the plane moves away from you, the wing nearest you is lighter than the other. Naturally, if the plane moves toward you, the wing nearest you is the heavy one. Add weight to the light wing. Once more, trim for level flight, then repeat the loops. Follow this procedure until the plane tracks straight through at least three loops.

Once lateral balance is achieved, return the plane to level flight and reduce the throttle to a setting that will just allow the plane to maintain altitude. Now, trim the elevator and *rudder* for level flight. When this is achieved, advance the throttle and re-trim for level flight once more, this time with the *aileron* in conjunction with the elevator.

It's rather obvious that all the controls interact. If the proceeding steps are repeated once more, a compromise should be reached, and the typical sport or training plane should be properly trimmed.

This trimming procedure assumes that the thrust line of the plane is correct. An offset thrust line can add to trim problems and, in some instances, render proper trim impossible. Thrust changes are an invaluable tool to free-flight planes, but are of little use to a radio-controlled one.

Randy Randolph, c/o *Model Airplane News*, 632 Danbury Rd., Wilton, CT 06897. ■

Control Tower

by CHARLIE KENNEY

THIS MONTH I'll review the Hobby Shack* Cirrus PCM 5-channel RC-5JKP system, the third Cirrus radio I've had the pleasure of reviewing. I'm still flying the Cirrus reviewed in *Model Airplane News* back in January of 1983 and it's still working great. I guess the most exciting aspect of *this* radio is that it is PCM and, interference-wise, it really makes a difference. For a most affordable price, you get a 5-channel PCM radio, dual rates on elevator and aileron, servo reversing on all five channels, microprocessor controlled transmitter and receiver capability, four servos, an abundance of accessories, and Ni-Cds throughout. Perhaps for our new readers, a brief description of Pulse Coded Modulation (PCM) might be in order.

PCM is a unique, advanced modulation system which was originally designed to provide rejection of jamming signals in military equipment while retaining the ability to receive its own coded message. This approach of "anti-jamming" has been applied to R/C for the purpose of rejecting an interfering signal. Let's talk a little about what PCM can do for our R/C hobby.

Pulse Coded Modulation, in its simplest terms, means that the transmitter RF signal is encoded into a stream of binary digital bits (zeros and ones). This differs from the other forms of pulse modulation by requiring that the sample values of the signal be quantified into a number of levels and subsequently coded as a series of pulses for transmission. By selecting enough levels or channels, the quantified signal can be made to closely approximate the original continuous signal at the expense of transmitting more bits per sample. The PCM scheme lends itself readily to time multiplexing of channels and will allow widely different types of signals; however, synchronization is always required. This synchronization of the system can be on a "single-sample" or "code-group" basis. The synchronizing signal is usually inserted with a group of samples from different channels, on a frame or subframe basis. You can drop pulses, but the transmitter synchronizing pulse train or code group always gets your receiver in synch to get the next set of orders to your servos. Microcomputers within the transmitter and the receiver know the code words. Therefore, it is very difficult to interfere with the signals of a PCM radio unless the interfering source is right on top of you.

The conventional digital FM radio uses one pulse for every servo function, which varies in accordance with the transmitter operational control signal. A PCM system starts by using a code word for the first transmitter function. Information then follows, consisting of a pulse train which is determined by the stick

A very affordable 5-channel PCM radio is this Cirrus from Hobby Shack.

Full system includes transmitter, receiver, four servos, Ni-Cds, and accessories.

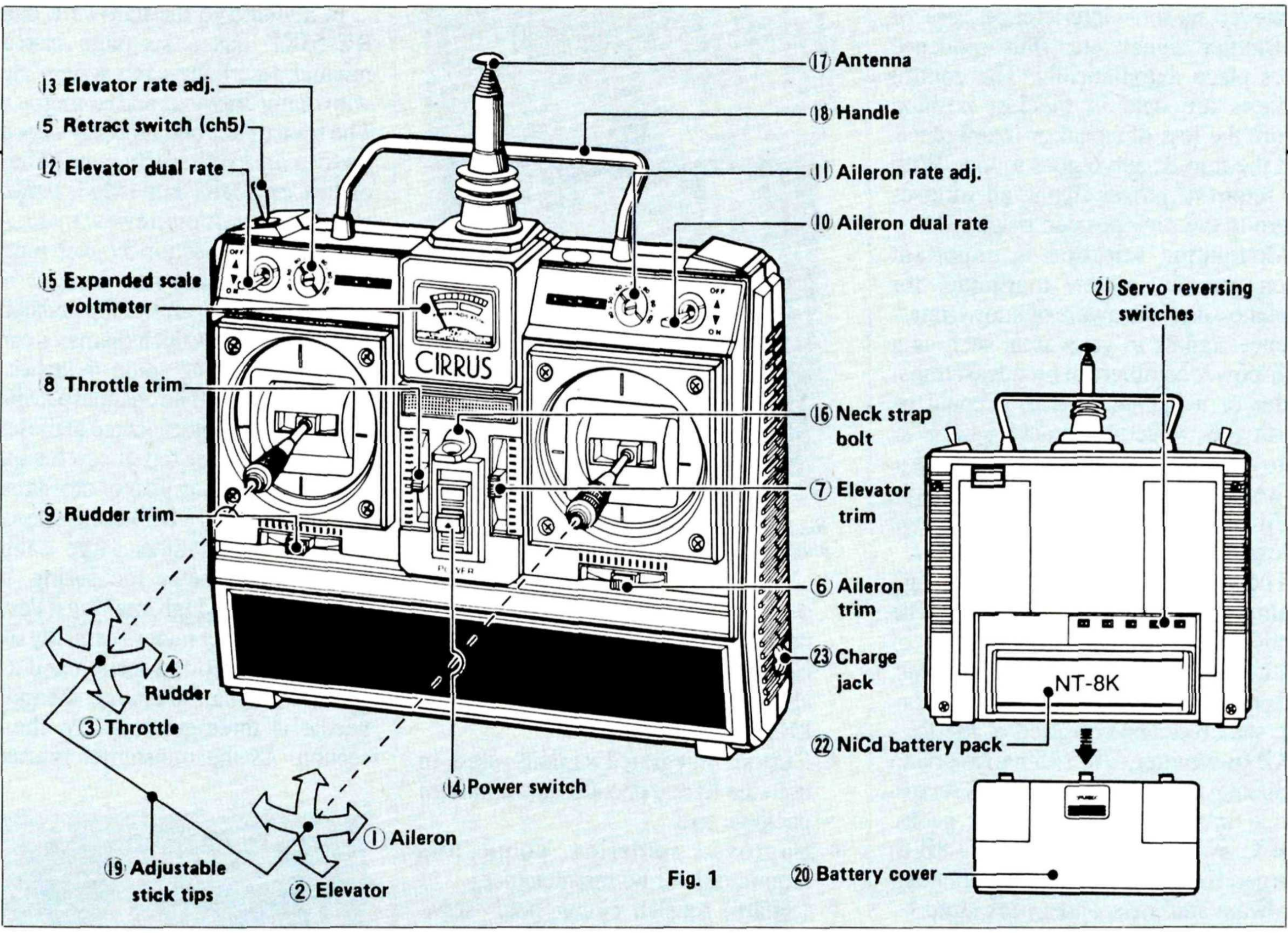


Fig. 1

positions of the transmitter. The microcomputer in the receiver identifies the signal for the function and passes the information to the proper servo only if the code word received corresponds to the one stored in the receiver. The receiver computer is programmed to repeat the information received until the code word is identified and then pass it to the proper servo.

The receiver computer works at a very high speed. Therefore, all information on the stick or switch positions of the transmitter can be repeated at a very high rate in 1 second. Even if a code word is received incompletely or incorrectly several times because of interference, it will not have any adverse effect due to the high rate of repetition.

If the degree of interference is sufficiently high to not permit the receiver to get any information which can be identified as "correct" for more than 1 or 2 seconds, a fail-safe condition could be declared, all flying surfaces neutralized, and the motor set to low. The Cirrus RC-5JKP system fail-safe operates as follows. If the receiver loses the signal for

SPECIFICATIONS

RC-5JKP TRANSMITTER

Configuration: Two-stick/5 functions with servo-reverse on all five channels
Frequency: 72 MHz only
Modulation Type: FM Pulse Proportional Modulation
Power Requirement: 190 mA/9.6V
Size: 7.0x6.8x2.2 inches
Weight: 1 pound, 13 ounces

CR-225 RECEIVER

Type: Single Conversion FM-PCM
Channel Spacing: 20 kHz
Frequency: 72 MHz only
Power Requirement: 15 mA at 4.8V
Size: 1.38x1.98x0.81 inches
Weight: 1.38 ounces

CS-238 SERVOS

Pulse Width: 1.52 ms positive pulse width control
Operating Voltage: 4.8
Current Drain (idle): 6.4 mA at 4.8 V DC
Torque: 49 ounce-inches
Speed: .23 sec./60 deg.
Size: 1.6x1.6x0.8 inches
Weight: 1.5 ounces

whatever reason—interference, loss of transmitter signal, etc.—this sequence takes place automatically. The control surfaces are held in the last position before the loss of signal or interference, and the throttle servo goes to low. With the return of proper signal, all surfaces return to the stick position being held.

Modulation selection is important when you buy a new transmitter for airplanes. If you're aware of known interference signals in your area, such as a high-power commercial broadcast transmitter or a paging service, it could be worth your while to contact a local R/C club or hobby shop before buying a radio. However, as a general rule of thumb, PCM is least susceptible to interference followed by FM and AM in that order.

The Cirrus RC-5JKP is a very high quality radio and very well made. The handsome transmitter is constructed of black plastic and brushed silver plastic, and employs Mode II stick configuration. The set I received consisted of the RC-5JKP transmitter, CR-225 narrow-band 7-channel receiver, three CS-238 servos, Ni-Cd transmitter and receiver packs, type-C switch harness, HS-FBC-8B(6) charger, frequency flag, servo-mounting hardware and trays, and a neck strap.

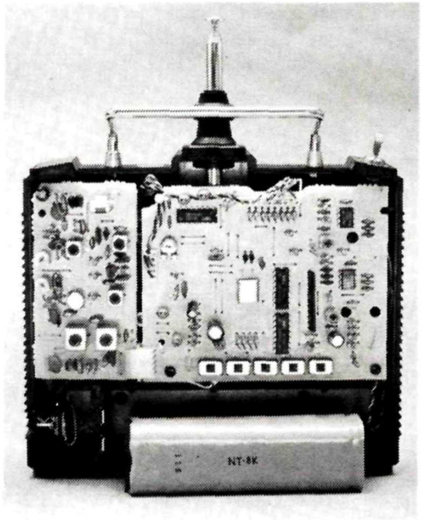
Let me enumerate some of the new Cirrus Wave 5 systems features:

RC-5JK TRANSMITTER

- Robotic component insertion and soldering provide the utmost in quality and consistency of manufacture.
- Stick assemblies are adjustable both in length and spring tension.
- Servo-reversing switches are provided for all five channels.
- High-tech type transmitter which feels good and is easy to handle.
- Dual-rate switch settings are adjustable on the transmitter front panel.
- Square transmitter output level meter is easy to read.
- Neck strap is provided for those who prefer to use it.
- Vari-Trim Throttle system allows trim of idle setting without affecting the high throttle setting.
- Nickel cadmium (Ni-Cd) battery pack.
- Eight-section 37-inch long telescoping antenna provides good radiation efficiency.

CR-225 FM-PCM RECEIVER

- Special single-chip microprocessor decodes the encoded transmitter signal quickly and accurately.
- Narrow-bandwidth ceramic filter allows use of R/C channels only 20 kHz apart.
- Custom integrated circuits used in both the IF and decoder for minimum package size.
- Improved solderless connectors require little or no maintenance.
- "Smart" squelch circuit holds servo position when momentary interference occurs.
- FM mode aids in minimizing most man-made noises.
- Through-the-hole plated fiberglass printed-circuit board insures solder joints which are more immune to vibration failure.

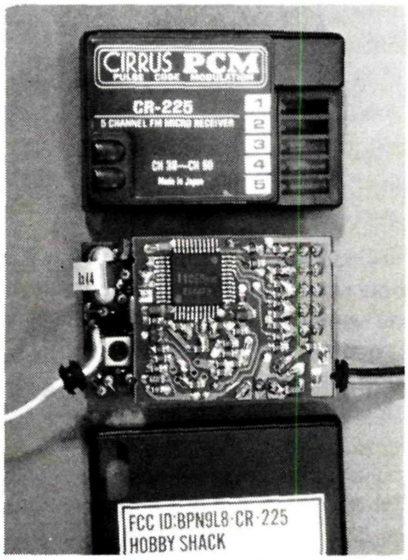


Rear of transmitter with cover removed displays a neat electronic layout.

CS-238 SERVO

- Long-life precision motor.
- Proven indirect drive sealed potentiometer is vibration resistant.
- Custom ICs for high torque and superior neutral accuracy.
- Fiberglass-reinforced PBT (polybutylene terephthalate) injection-molded servo case is strong and fuel resistant.
- Strong polyacetal resin precision gears provide smooth operation and almost zero backlash.
- Through-the-hole plated fiberglass printed-circuit board is more immune to vibration.
- Improved rectangular servo grommet reduces vibration effect on servo.
- Splined output shaft allows easy adjustment of the servo arms.
- Compact size allows use in many models with limited space.

In addition to the hardware data, the RC-5JKP has a six-page instruction manual describing each system element with many drawings and isometric views. The transmitter and airborne system isometrics are particularly good. The heart of the Cirrus 5JKP is the Mode II transmitter, so let's start our review there. At the top is an eight-section 37-inch long telescoping whip antenna located in the center of the transmitter top and behind it is a convenient 1/4-inch diameter carrying handle measuring some 4 inches wide and 1 inch high. The channel 5 switch is a two-position toggle located at the left side of the transmitter top. It can be used for retractable landing gear or other auxiliary function. Directly below the telescoping antenna is the rather large calibrated output level meter measuring 1-inch wide by 3/4-inch high, making it very easy to see. The level meter is equally divided into a calibrated red section and a silver section. With a full charge, the indicator needle is three-quarters into the silver section. As the transmitter is used, the needle will drop. When it's close to the red side of the indicator, it's time for a charge. You can normally expect to get about 1 hour and 30 minutes or so from a fully charged transmitter pack.



Receiver is quite small and features plated fiberglass PC board.

Moving back to the left side of the transmitter we have the rudder and throttle stick. The Cirrus radio series employs open gimbal assemblies which are well made, are adjustable in length, and have smooth action. In addition, the spring tension on the sticks can be adjusted to

(Continued on page 127)

Small Steps

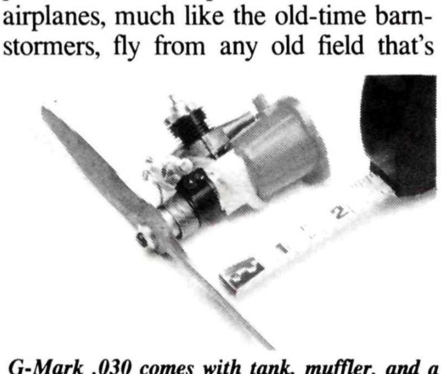
by RANDY RANDOLPH

R/C Gear for Diminutive Models

It took a long lens to get this in-flight shot of the Storm Petrel. Note vertical whip antenna.

BY NOW I've received a lot of input from readers who share my enthusiasm for small radio-control model airplanes. In all this exchange of information and ideas, I can see an underlying philosophy in our efforts, a philosophy that is worth mentioning.

We prefer *informality* in our model building and flying. The .40-power-plus people seem to go for organization, official club flying sites, and regulated flight patterns. But we pilots of small R/C airplanes, much like the old-time barnstormers, fly from any old field that's



G-Mark .030 comes with tank, muffler, and a wide speed range.

available, whenever the opportunity arises. *(Hopefully after determining that no other clubs are operating in the area—RU)*

We fly all over the sky with our lightweight miniatures instead of being restricted to procedure turns, base legs, and the like. We can do this without danger because we don't fly with a mob of others around. Usually, we go out flying alone, or with one or two friends at the most. We build to please ourselves; not to impress others or to try to win trophies. We prefer the relaxed, easy-going approach to our hobby to the high-pressure, strictly regulated style.

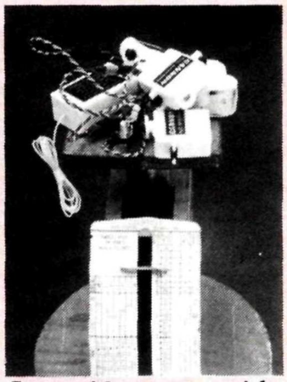
And we also seem to be good at attracting newcomers to our hobby! Many others have mentioned experiencing the same thing I have: in flying from schoolyards and parks we're far more visible to the public than those whose R/C flying is done at remotely located sites. People come to watch us, ask questions, and maybe even take the transmitter for a few minutes when the model is high in the sky.

We are glad to introduce others, particularly youngsters, to the wonders of radio-control model flying. We fliers of small, lightweight R/C models are a nice bunch of guys to get along with. We're helpful, friendly, and non-competitive. We do our hobby a great deal of good, and I'm proud to be one of this large and growing group of R/C pilots.

With that said about the men, let's consider a more technical, and related, aspect: the machines.

There's a lot to consider when buying

(Continued on page 123)



Cannon airborne system weighs less than 4 ounces.

Cannon's 3-channel Super Micro System, miniature Tx.

Ace Silver Seven customized Tx for single-handed flying.

CLEAR LAKE

Ken Runestrand launching Charles Richard's 12-foot Super Cub. Note PVC pipe dolly.

FLOAT-FLY

Steve Lenz' Balsa USA float-equipped Phaeton logged its 100th flight at Clearlake.

America's premier R/C seaplane meet just keeps getting better.

C L E A R L A K E

by JOHN SULLIVAN

Gary Gleffe's Decathalon and Bart Van Syoc's Big Rainbow run-up at the ¼-scale ramp.

I'M OF THE OPINION that the first thing a modeler should do, after making that last flight to his great reward, is to find out if he can get time off to attend the annual Clearlake Float-Fly. I don't know how many angels dropped in, but the Clearlake Modelers counted 106 pilots from five western states plus Florida, Massachusetts, and Colorado, which registered 135 floatplanes for this fantastic three-day meet.

With the exception of a two-hour blow late Saturday afternoon, the weather was perfect for float flying, dead calm morning and evenings with hazy to sunny skies all day, a steady 5-mile afternoon breeze, and temperatures in the mid-80s. The setup at Lakeport is absolutely perfect. The two-block-long City Park, complete with huge shade trees and mowed lawn is used for transmitter impound and pit areas. There are bleachers and walks along the shore's edge with finger piers leading out to a 400-foot-long dock with an elevated lifeguard shelter which doubles as the control tower. To top it off there was an antique steam-launch meet a mile away the same weekend, and every so often a procession of those brass and mahogany beauties would steam past the buoy markers and blow their whistles.

This is a fun-fly in every sense of the word. As a result, no awards were given, but some of the exhibitions and efforts were so exceptional they demand reporting. For technical achievement I think everyone would give the nod to Charles Richard's 12-foot scratch-built Piper Super Cub on EDO floats. Charles is a retired aeronautical engineer, and he built the 60cc Kawasaki-powered 41-pound Cub to exact scale. Each trussed rib of this flawless scale ship was made up of 52 pieces, every detail of the struts and floats perfect down to the last nut. As if the above were not enough, Charles didn't bring just one 12-foot Super Cub; he brought *two* of them. Equally worthy of note was the introduction of an operating amphibious landing gear and rudder setup which is now being manufactured by Alan Johnson and Jimmy Durham of Sacramento, California. The steerable castering bow wheels and the step well wheels have over

Sig Morrisey Bravo on scratch-built V-bottom flights.

Author's 86-inch Druine Turbulant on Gresham floats was modified from a Precedent kit.

The weather was perfect for float flying.

Clockwise from top left: Mike Harrington's CAP 21 on fly-by; Don Loughridge's L4 military Cub from Practical Scale kit; Rich Erwin with his Nieuport 11 on scratch floats; Chuck Fuller's Fleet biplane has over 300 flights.

center geometry and they retract up into the float hull as the cable-operated rudder drops down.

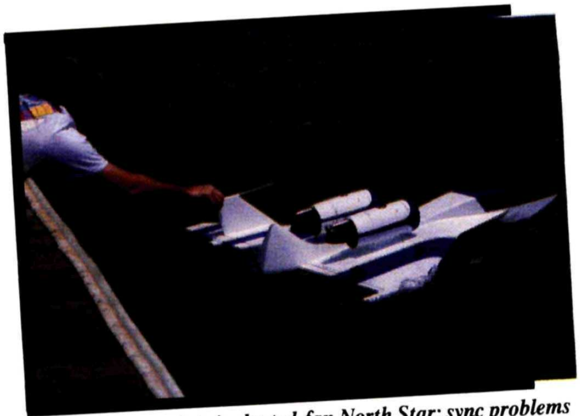
The quality of flying was very high and there were exhibitions to marvel at in every sector from pattern planes to old timers. Picking one pilot over another would be so subjective as to be meaningless, but a couple of flights should be described to indicate the level of competence at this fly-in.

The first occurred after Friday's flying had ended and an hour before sunset when Chuck Fuller set his five-year-old Fleet Bipe in the water at the shore below the Willow Point Resort. For the next half hour, the modelers who were camped there got to sit on the lawn and watch one of the most realistic flights you could ever hope to see. Chuck flew the entire flight in a 360° circuit so huge you had trouble seeing or hearing the plane on the back side, and then that big 1/4-scale Fleet would come roaring past the shore, sometimes inverted, sometimes knife-edge, even cross-controlled right up to the ragged edge, all the while following that 360 like it was a rail.

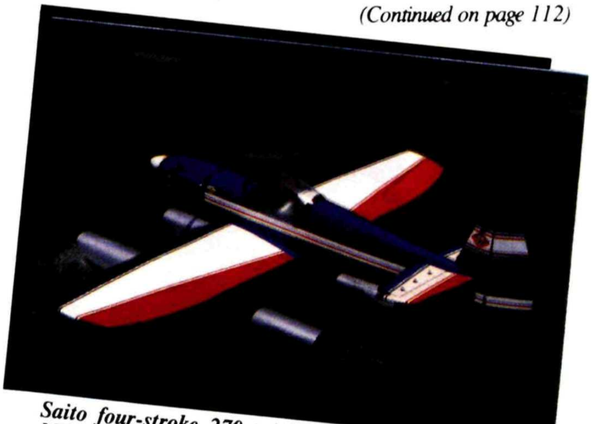
The second flight of note took place Sunday morning when Roger Grotheer took my 1/3-scale Druine Turbulant up for a little spin. After three years it's become a tradition for me to turn my newest floatplane over to Roger to see what it'll *really* do. This is done with no minor trepidation on my part because of Roger's comments from years past like, "I didn't think it could really do that," while pulling out of a secondary stall 5 feet over the water. I had come to believe the Turbulant was too stable to fly aerobatics, and yet by the second flight Roger had it doing sixteen-point rolls and the tightest rolling 360 imaginable. On his landing he had the flare so well controlled that the rudders dragged 25 feet through the water before settling in.

If the weather, the planes, and the flying were the cake

(Continued on page 112)



Chris Delinger's twin ducted-fan North Star; sync problems kept it down.



Saito four-stroke 270-twin-powered CAP 21 by Mike Harrington looked and sounded terrific.

A .25-powered advance performance seaplane.

Step-Up

by ED WESTWOOD

SEVERAL YEARS AGO, I designed a .19-powered, 400-square-inch trainer that would take strap-on wheels or floats. It weighed 2½ pounds on land and 3½ pounds on water. Initially, it was a poor performer on those strap-on floats so I redesigned the attach fittings to cut out the heavy plate. Over the years, the wing got ailerons, a .20 replaced the .19, and the combination picked up over 150 hours. It sits on the shelf today, still in commission, needing only fuel and a charge to fly. But it got boring and I knew it was time for a Step Up. When I design a plane, I set the performance goals first. Snappy takeoffs, vertical climbs, eye-blink rolls, slow landings, and little trim change with speed. Boy, I didn't want much, did I? In retrospect, I did come close! I chose the basic dimensions of my old convertible but with a larger tail, a slightly larger semi-symmetrical wing with no dihedral, and an O.S. .25 FP for power.

After the first flight I knew I had a tiger by the tail. The only problem was upgrading my flying skill without destroying the airplane in the process. Lucky it's a seaplane 'cause the only mishap it's had was when I took off with the ailerons disconnected. I only bent up the struts. I also found that by going from a 9x6 prop to a 11x4, the static thrust increased from 2.7 to 3.1 pounds. Although restricted in top speed, I almost got my vertical performance since my final weight was just under 60 ounces. The key to any kind of seaplane performance is light weight. The floats, including attach fittings, weigh only 11 ounces. For your second float plane, take a Step Up.

CONSTRUCTION. The fuselage is open frame aft of the wing and 1/32-inch plywood monocoque forward. Begin by building both sides over the plans and gluing each 1/32-inch-ply skin to its appropriate side between bulkheads 3 and 4. Square up the sides and secure to bulkheads 3 and 4. Glue the rear together and fill in the crossmembers, gussets, and diagonals. Now wet and pull the sides together around the tank plate-bulkhead assembly. Glue the lower nose block between bulkheads 1 and 2 and trim. Pulling, fitting, and securing the forward fuselage takes a little skill and patience. Take your time and trim the gore a bit at a time as the skins are secured to the nose. Now align the bottom skin and secure. Tite Bond the float attach fittings,

Author's daughter Lee Ann holds Step-Up, which is powered by an O.S. .25 FP. Airplane weighs 60 ounces.

photo by M.A. CUMMINGS

engine pads, and wing hold-down blocks in place. Temporarily mount the engine and tank. Drill the throttle sheath holes and secure the cable assembly. Drill the fuel line holes to match the tank tubes. Anchor the servo rails and clean up the fuselage.

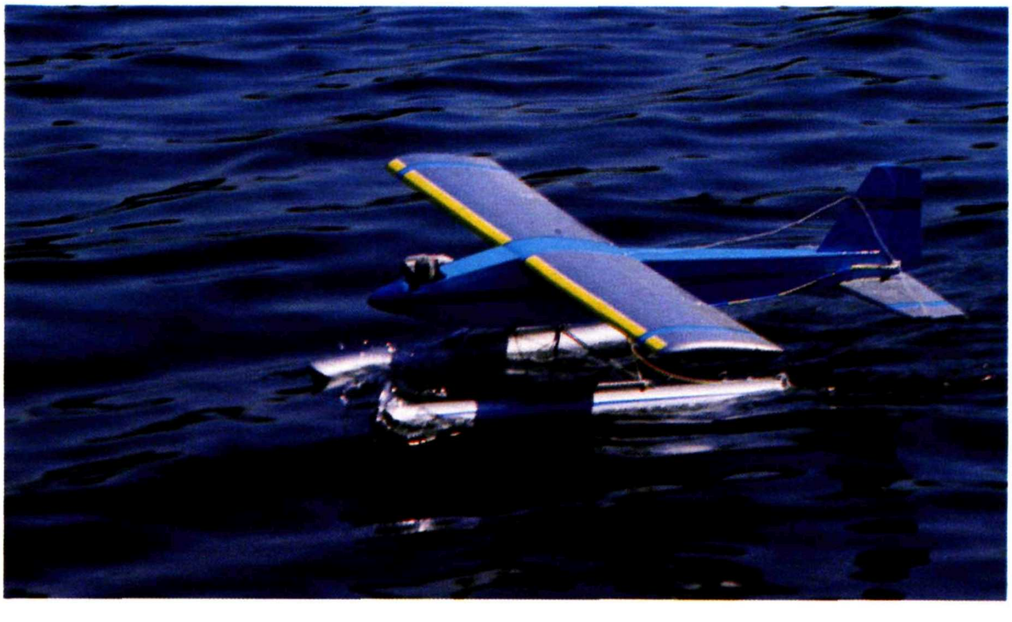
Build the wing next because the dowel holes must be drilled through bulkhead 3 into the wing leading edge. The wing is assembled trailing edge forward. 48-inch material will save scarf joints but 36-inch will do. Bevel the 1x1/16-inch trailing edge stock before pinning it down. Add the lower spar cap and then the ribs. After

Takeoff run with Ed Westwood at the controls. Light weight is the key to successful float operation. Step-Up gets up on the step quickly.

gluing the alignment tang to the leading edge, slide it into the rib slots and secure. Next, install the upper spar caps and trailing edge. Remove the wing and glue in the false ribs before the lower spar cap. Carefully fit and glue in the shear webs then cut the ailerons loose. Trim the ribs and secure the aileron spars. Install the bell cranks, pushrods, ny-rods, and aileron ball link. Shape the leading edge using a template and make the tip blocks. Now align and temporarily attach the wing to the fuselage. Drill 3/16-inch holes through bulkhead 3 and the wing leading edge. Secure the dowels in the wing. Glue a piece of trailing edge stock inside the root trailing edge then drill through the trailing edge into the hold-down blocks and tap for 8-32 nylon screws. Now remove the wing, cover the root section with 1/64-inch plywood, fit the servo and finish in the standard manner. I covered mine with MonoKote*. I have subsequently been very pleased with Mica Film* and would recommend one of their bright colors on the wing and tail surfaces.

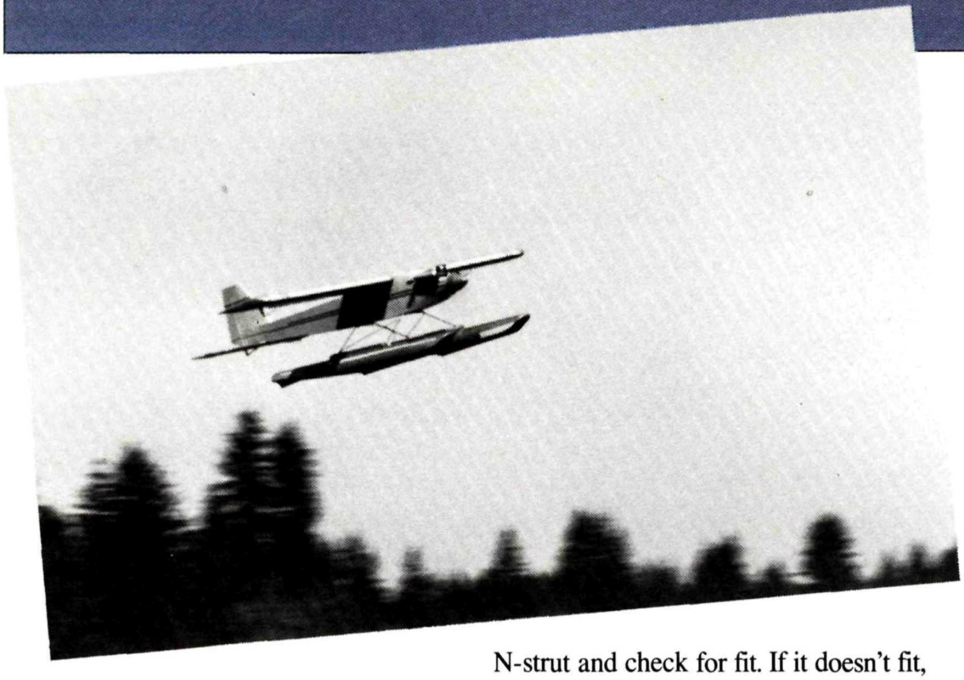
My prototype has balanced-0009 airfoils. Although great looking, the building time required and complexity just isn't worth it. What you see is the same planform using classic construction. After covering, be sure to seal hinges during installation; water just loves leaky hinge slots. I really like Lake Hobbies* Easy Hinges because they cyanoacrylate in place and are waterproof.

The floats weigh less than 4 ounces each so hang in there. Either glue two 3-inch sheets or use 6-inch stock to make two 6x28x1/16-inch panels. Ballpoint the centerline and the bulkhead positions then soak the sheets. Pat dry and pour household ammonia over them. Now position them, one at a time, over a 3-inch-diameter mailing tube and bind them down with 1-inch surgical gauze. When dry, you'll have two semi-circular balsa float skins.



Using the alignment marks, glue in the bulkheads and trim along the chine lines. Install the nose curve and keels, then bevel. Give them a coat of thinned clear dope inside and out then glue on the bottoms and nose blocks.

The lightest durable covering is MonoKote. Lap the seams at least 1/4 inch. To check for watertightness, run your mouth along all the seams, especially the step area. If you can suck air out, water can get in. Seal with clear tub seal (RTV) or slow cyanoacrylate. After the hard backs are drilled and shaped, trim away the

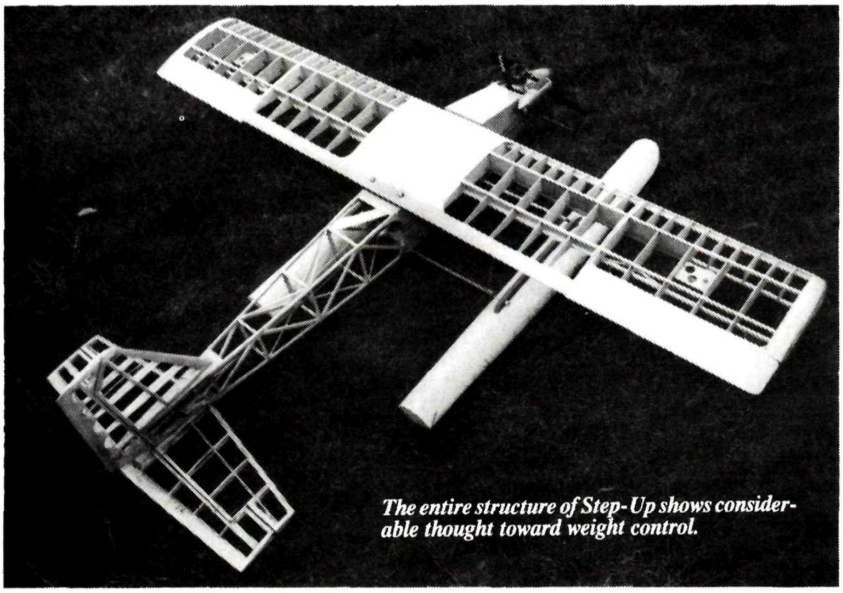


Tail surfaces exhibit strong, light, multi-part construction.

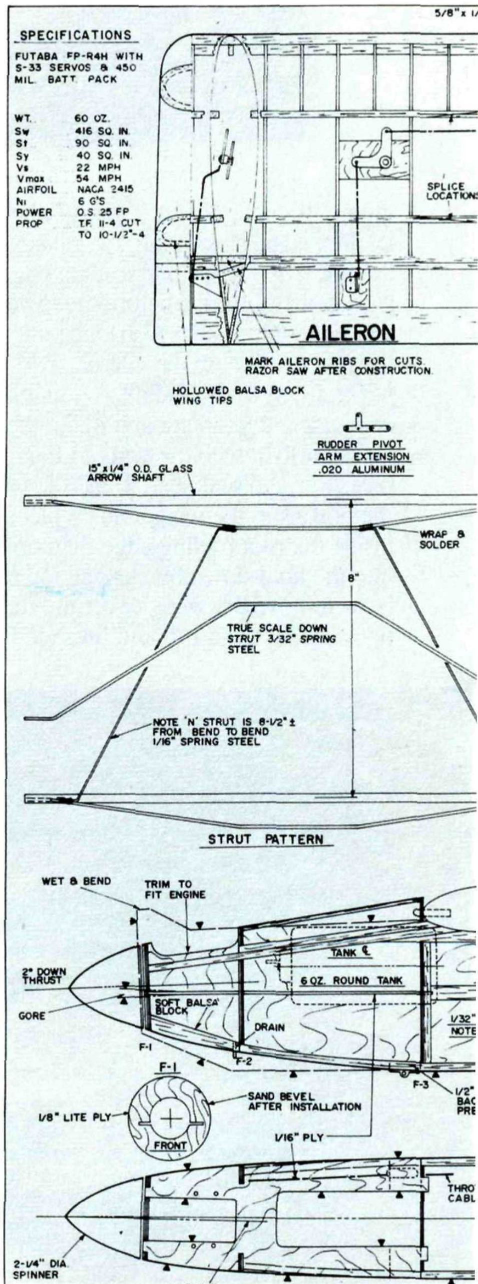
MonoKote on the floats and epoxy them in place along with the sub fins. Paint with matching polyurethane.

Attach fittings. The best way to do this is to build a jig. Cut your ¼-inch-OD arrow shafts to 15 inches and drill 3/32-inch holes as shown on the plans. Elongate the holes and razor saw a slit halfway to the ends. Bend the down-struts and file some notches on the ends to give the epoxy a surface. Position wads of cotton just inboard of the holes in the fiberglass spreaders. Slip the down-struts in the spreaders; flex them a bit, they'll fit. (See why the slits are there?) Tape the joints and fill the ends with warm epoxy; now you see why the cotton is there. Position the down-strut-spreader assemblies in the jig and lock them down. Bend a 1/16-inch N-strut and check for fit. If it doesn't fit, make another. When they fit with no interference clean the joint area well, bind with copper wire, and solder.

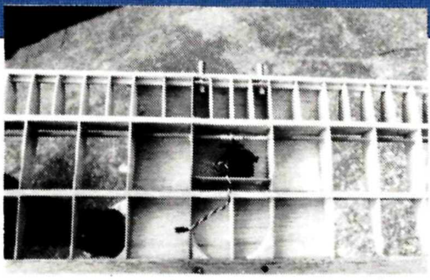
Complete the nose section now that the dowels have been positioned in the wing. Remember to pack some foam



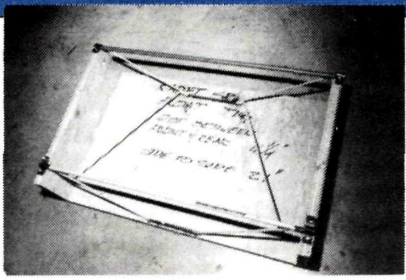
The entire structure of Step-Up shows considerable thought toward weight control.



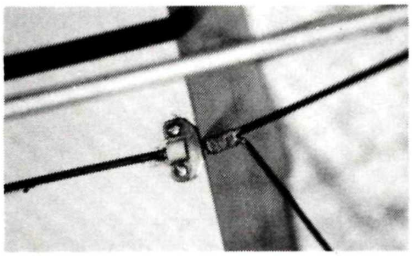
FOR ORDERING INFOR



Uncovered shot of wing center section shows aileron servo installation.



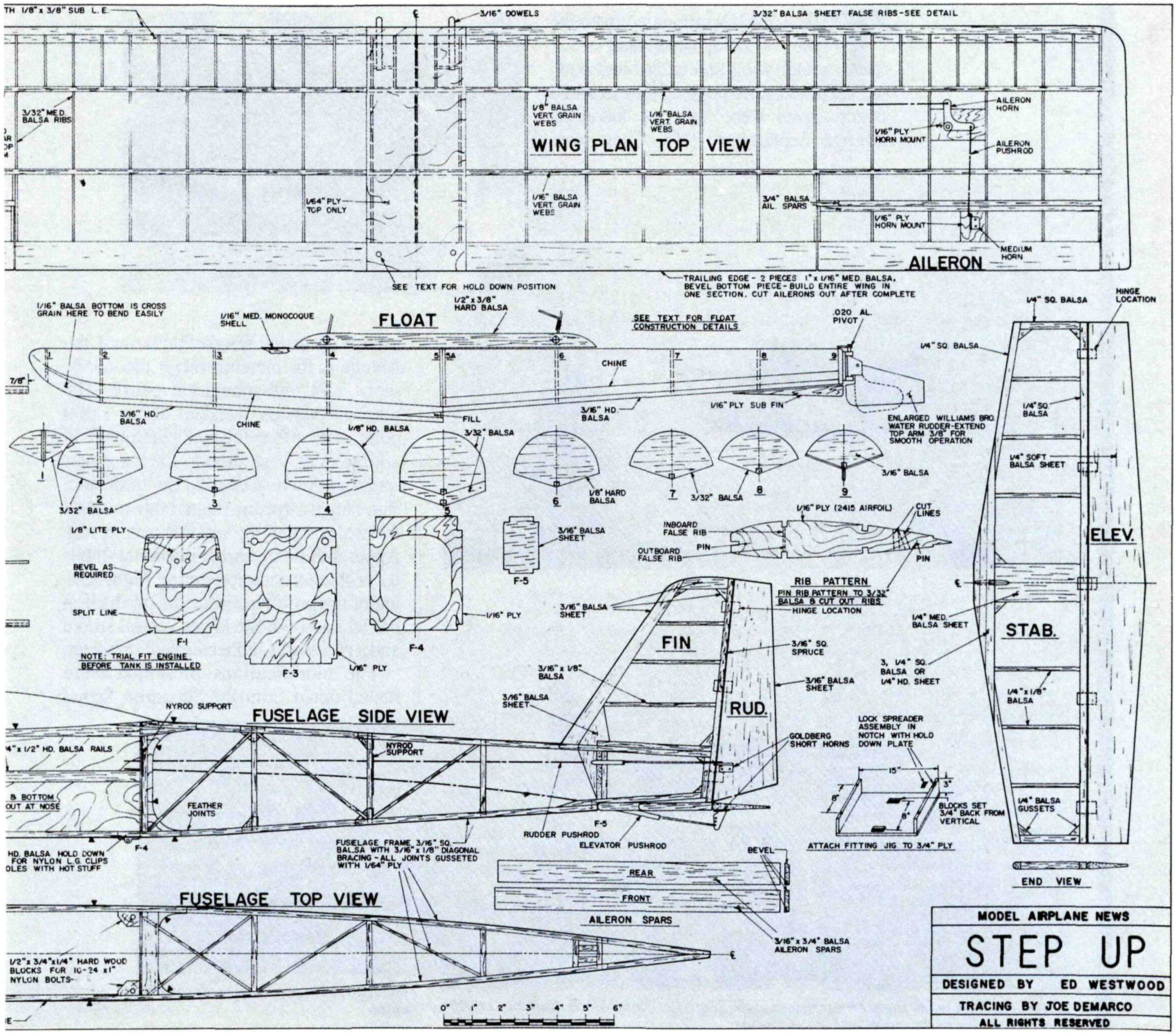
Float jig is used to properly align position of the floats.



Brass clips keep wire from slipping sideways, aiding in positive float position.

around the tank before closing. Epoxy blind nuts under the engine bearers and coat the engine compartment with polyurethane. Install the ny-rods, including their supports, at mid-fuselage. Now MonoKote the fuselage and install the tailgroup. Be sure to align with the wing. Cyanoacrylate the floats on the fittings and attach to the fuselage with 3/32-inch hold-downs. Using 25% for initial balance, install the receiver, On/Off switch and charge jack. The S-33 servos are positioned to the rear of the radio compartment. The water rudder is secured to the left float and the ½A throttle cable rudder actuator is wired next to the air rudder clevis and secured to the fuselage with color-matching plastic tape. The

(Continued on page 113)



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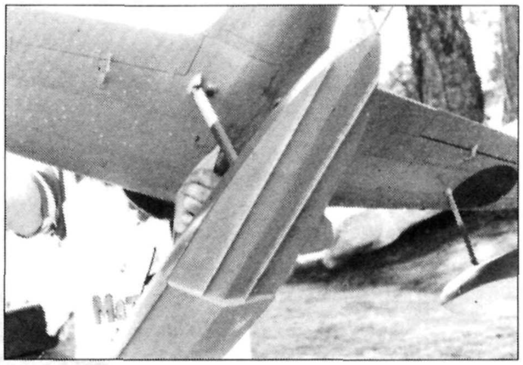
A6M2-N Rufe

The venerable Zero takes to the sea...

CONVERSION

by ED WESTWOOD

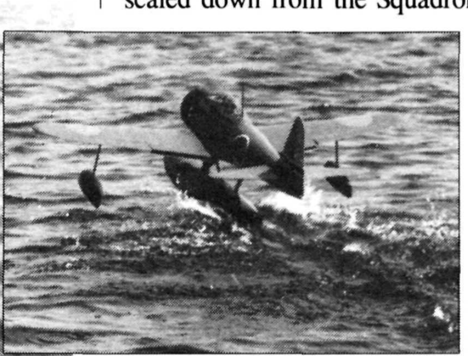


Rear of float shows water rudder attachment strut and strakes. Main float is efficient.

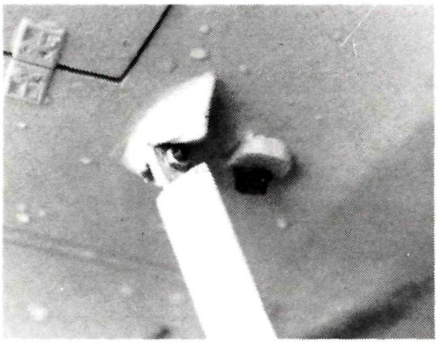
THE A6M2-N originated from the type 11 Zero, which had a 12-meter wing and early blunt cowl with exposed gun troughs. Three hundred twenty-seven were built by Nakajima through September 1943. They were used both in the South Pacific and the Aleutians for medium-range reconnaissance and anti-submarine patrol. The seaplane version weighed about 1,000 pounds more than the land plane and had a large float V-strutted to the wing rear spar and down-strutted to the front spar. The single-strut tip floats both touched the water when the aircraft was at rest. Apparently some early directional stability problems occurred during flight-testing of the prototype since the production model had both the lower ventral strake and a noticeably higher vertical stabilizer.

The modifications presented were scaled down from the Squadron Signal

Above: The Rufe in full flight brings visions of the South Pacific in WW II. Bottom: Only the propeller is clue to the model rather than full-scale.



The Zero on the float step ready to break water.



There is nothing that so significantly changes the character and appearance of an airplane as do floats, particularly when that airplane is a warbird.

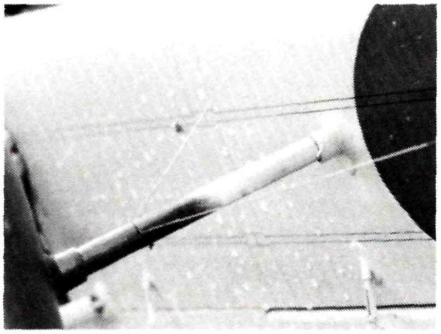


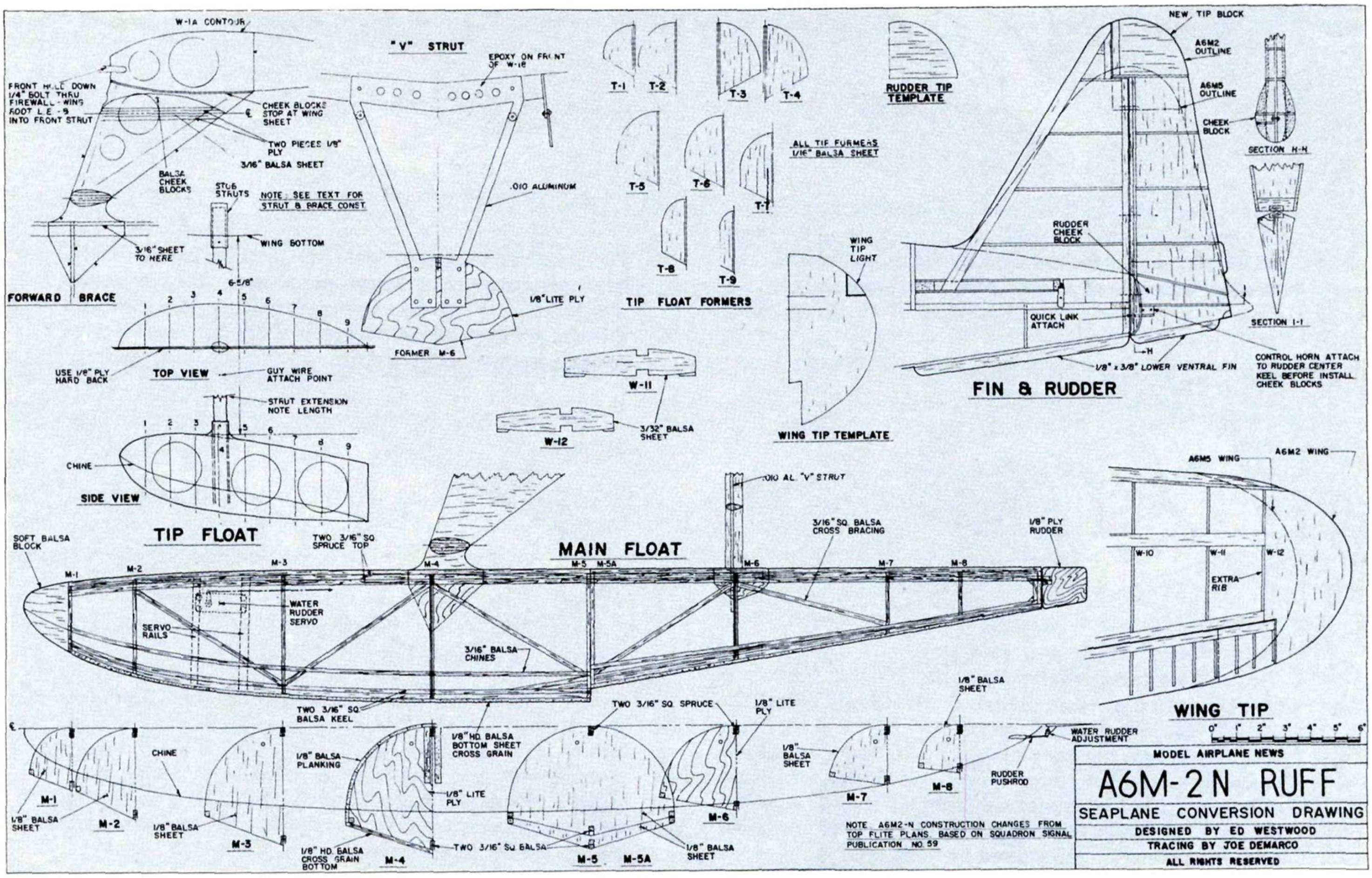
photo by M.A. CUMMINGS

Rear strut attachment to the fuselage. This Rufe model began life as a Top Flite kit. Also shown is the outboard float strut.

A6M publication three-views and photos. I selected the Top Flite* kit because it is the A6MP version. A Royal Rufe has a nice ring to it but they're A6M5s.

CONSTRUCTION. The fuselage should be built as the plans suggest but with the cockpit floor extending down only far enough to accommodate a 1/6-scale pilot bust. Remember, the seaplane had no roll bar. The reduced-depth cockpit allows the fuselage servos to be positioned right behind the fuel tank. Everything you can do to keep the weight forward will pay off with less nose weight. Install an internal antenna tube during construction. Don't bother with the fillets until the wing is attached with some plastic wrap between the joint. I made my

(Continued on page 114)



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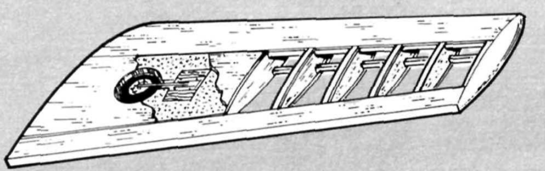
Hints & Kinks

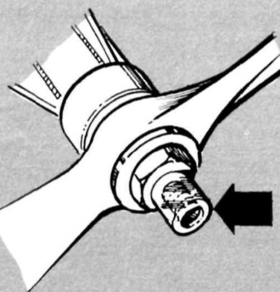
by JIM NEWMAN

Model Airplane News will give a free one-year subscription (or one-year renewal if you already subscribe) for each idea used in "Hints & Kinks." Send rough sketch to Jim Newman, c/o **Model Airplane News,** 632 Danbury Rd., Wilton, CT 06897. BE SURE YOUR NAME AND ADDRESS ARE CLEARLY PRINTED ON EACH SKETCH, PHOTO, AND NOTE YOU SUBMIT. Because of the number of ideas we receive, we cannot acknowledge each one, nor can we return unused material.



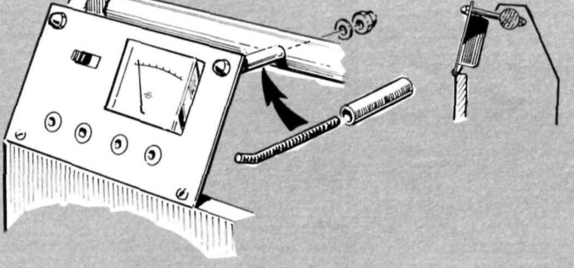
Here is a novel wing construction combining the advantages of foam core and built-up structure. The root end has a foam core filling between the spars and is sheeted as one would a regular foam wing. Retracts can be mounted as normal for this type of structure. This means a stiff root end with the lighter open structure tips, giving crisp rolling maneuvers due to lower inertia.

Dick Smith, Londonderry, New Hampshire



When an engine backfires there is a danger of the propeller spinning off. Reduce this risk by slipping a tight-fitting piece of fuel line over the threaded end of the propeller shaft. This prevents the nut and propeller from spinning cff.

Ron Giaberdini, Cecil, Pennsylvania

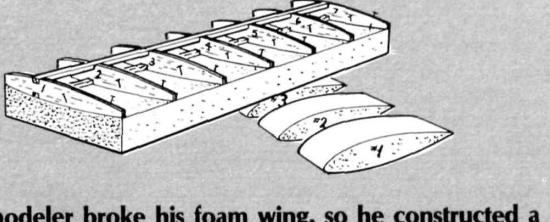


Those mini-totes such as the Goldberg field box don't allow much room for power panels, but this method of installation still allows full use of the top tool tray, and room for one's fingers on the carrying handle. Note the stand-offs made from threaded rods, outer Nyrod sleeves, and acorn nuts from the hardware store. Warning! The outer cover on the back of the power panel must be in place to avoid dangerous short circuits caused by tools, etc.

Gene Chase, Oshkosh, Wisconsin

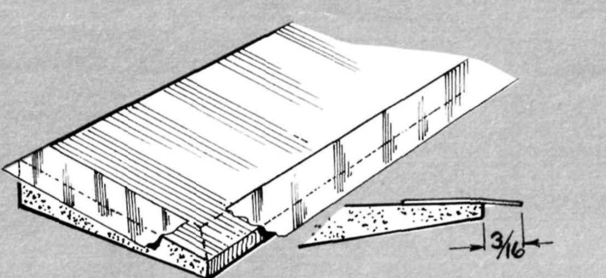
A different way of detailing your dummy pilot. Instead of the usual helmet and goggles, or "bone dome," try headphones and boom mike. A head band is a couple of layers of self-adhesive vinyl tape, and a single ear pad is a circle of sticky back foam with a plain washer glued on. A boom mike is a regular plastic headed dressmaker's pin. Pop over to your local airport to see what the well-dressed pilot wears!

Tom Collier, Newton, Kansas



This modeler broke his foam wing, so he constructed a built-up replacement using one of the foam nests from which the wing was cut as a building jig. He also sliced up the remaining good foam wing to obtain the correct cross sections from which to cut ribs.

Tom Ailes, Valparaiso, Indiana



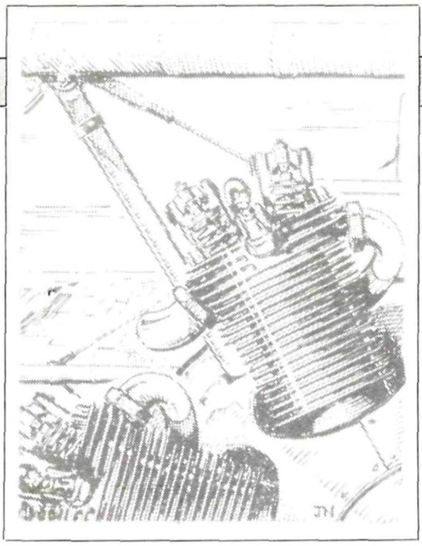
Spoilers should be sealed against air leakage. Ordinary Scotch Brand Magic Mending tape applied as shown, leaving a 3/16-inch overhang from which the adhesive is carefully removed with thinners. Bend flapped edge down slightly by rubbing finger along the edge. This allows the tape to be sprung against the wing when the spoiler blade is closed. Spoiler hinge not shown.

Ernie Currington, Kirkland, Quebec, Canada

The Operation of Four-Stroke Engines

Part III

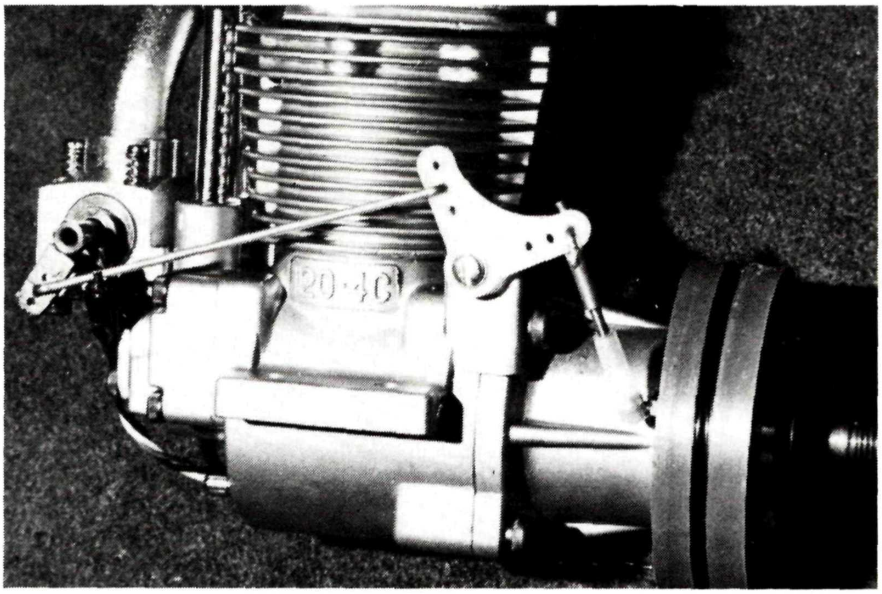
by PETER CHINN



STARTING & RUNNING. There are various starting techniques with model four-cycle engines—rather more so than with two-strokes. Some engines respond best to one particular starting drill; others are less critical. Some are easy to start when cold and less responsive when hot. With others the reverse is the case.

Obviously, the first thing to do when a new four-stroke has been acquired is to follow the manufacturer's instructions in regard to starting procedure. Generally speaking, no difficulty in hand starting will be experienced. However, as with two-strokes, some engines start more easily than others and it is not always the smaller engines, supposedly more suited to the beginner, that are the least foolproof. The new owner may have to persevere for a bit. Later, when the engine is broken-in and he has unconsciously adapted to its idiosyncrasies, he may wonder why he had problems at the beginning.

The alternative to patience and perseverence, in such cases, is to buy an electric starter. No engine that has a glow at the plug and sufficient (not too much) fuel at the carburetor, should fail to respond to being spun over with an electric starter. If it does, there is something wrong. We will come to this in a moment.



Enya 120-4C fitted with C.H. Electronics capacitive discharge ignition and throttle-coupled spark advance. The bell-crank linkage between the carburetor throttle arm and the timing plate containing the post-switch automatically matches ignition timing to throttle opening.

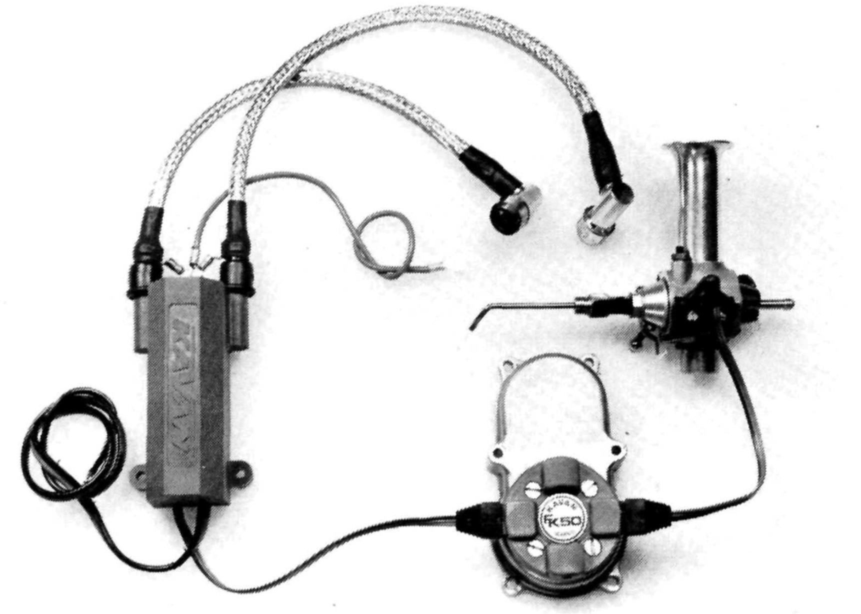
Check List

Let us suppose that a new engine has been set up, ready for running, as described earlier in this chapter. The basic engine list should read as follows:

1. Engine firmly mounted and propeller fitted *securely* to shaft. Refer to maker's instructions for appropriate prop size. Usually, a choice of several prop sizes will be given. Avoid the use of the smallest diameter recommended: medium sizes have higher inertia and make for easier hand starting, without overloading the engine when new.
2. Fuel tank properly positioned and filled with recommended fuel mixture. Use silicone fuel tubing for "plumbing" and install a fuel filter in the delivery line from fuel tank to carburetor. It is even more important to fit a filter in the outlet from your fuel container as this will trap most foreign matter before it reaches the fuel tank.
3. Remove glowplug from engine, attach battery leads to it and check that plug glows a bright red color by adjusting rheostat, resistance wire or lead length. Re-insert plug, screwing in with fingers to ensure that it is not cross-threaded, before tightening with plug wrench.

Basic Starting Procedure

Now to the actual starting. First, try whatever method or methods are advised in the manufacturer's instruction leaflet. Generally, such instructions can be relied upon, although it has to be admitted that, occasionally, makers' instructions can be needlessly detailed and complicated so that the user may well become a trifle confused



Kavan Twin electronic spark ignition system has two Hall Effect pickups, one advanced and one retarded with selection via a throttle-actuated microswitch.

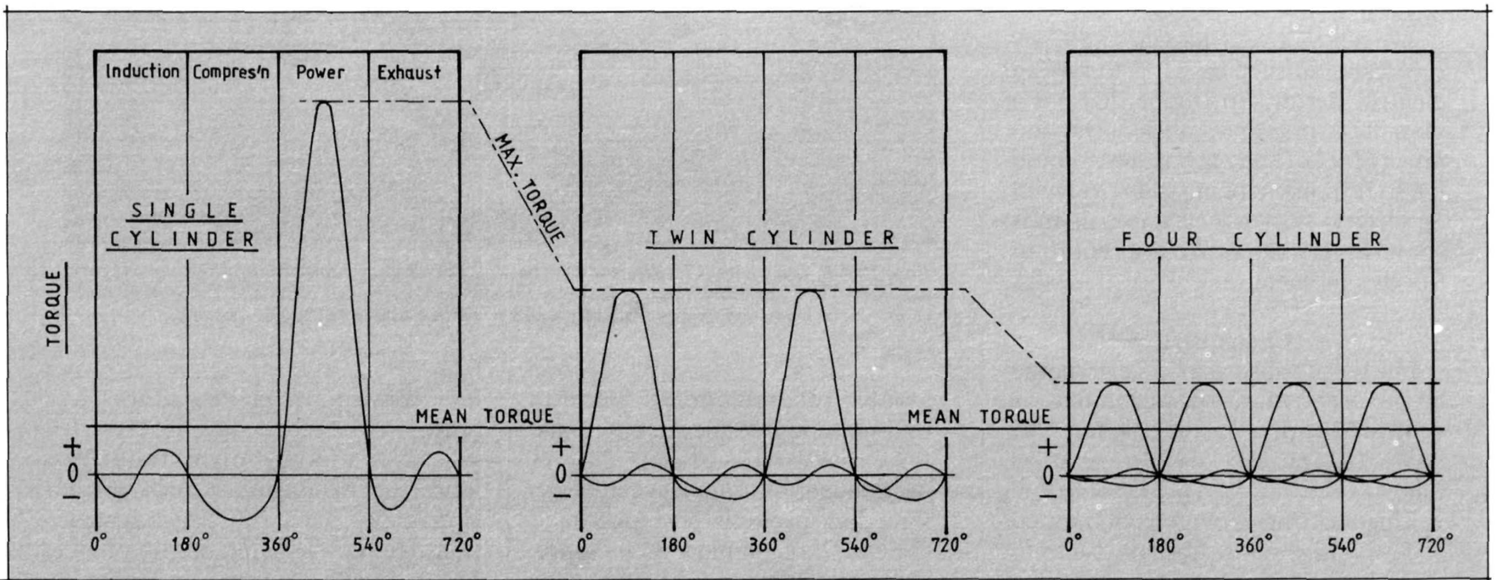
if he lacks experience of four-strokes.

If the engine does not appear to respond to the maker's instructions as well as might be expected, the following simple procedure may be tried instead.

1. Open needle-valve to starting setting and fully open throttle.
2. Choke carburetor intake and rotate prop just sufficiently to draw fuel through delivery tube to carburetor.
3. Release choke, close throttle to about one-quarter open and turn prop through two complete revolutions (i.e., to include one suction stroke) to draw mixture into cylinder.
4. Turn prop over compression to make sure that not too much fuel has been drawn into cylinder. (This is unlikely if the above procedure has been followed, but if excessive resistance or a hydraulic lock occurs (see below), turn prop backwards to eject excess fuel through exhaust.)
5. The engine is now said to be "primed." Energize glowplug, grasp prop blade very firmly and pull through top dead center on compression stroke. You should feel a slight "kick" as the mixture fires, indicating that the engine is ready to start. (If on the other hand, a sharp metallic knock is heard, check that the prop-nut has not loosened.)
6. Apply starter or flip prop vigorously. (Beginners are advised to first practice "prop flipping" without the glowplug energized, in order to become familiar with the "feel" of the engine.)

If the engine does not start immediately, keep the starter engaged for a few seconds or continue to flip prop. If the engine still refuses to start, disconnect glowplug battery and repeat prestart procedure, choking the intake for one extra suction stroke. Engines with updraft (rather than horizontal) carburetors, may need this extra choking because some fuel will drip from the intake before it can be sucked into the cylinder.

In cold weather—and provided that you have a fully-charged battery—it may help to leave the plug energized for 15 or 20 seconds to warm the cylinder and assist in vaporizing the fuel



Although torque produced by an i.c. engine is normally expressed in terms of average or mean torque throughout the cycle, it actually fluctuates widely. It reaches a peak during power stroke but varies between negative and small positive values during "idle" strokes when the piston is drawing in a fresh charge, compressing it and expelling exhaust gases. As these diagrams show there is an extremely wide variation between mean and maximum torque levels in a single-cylinder four-stroke engine. This violent fluctuation is a major cause of prop slippage with larger and more powerful single-cylinder engines. By dividing the engine's displacement between two alternate firing cylinders, the ratio of maximum-to-mean torque is greatly reduced. With a four-cylinder engine of the same total displacement, the magnitude of torque fluctuation is further reduced. It is these reductions that, with better balance, are also responsible for smoother twin and multi-cylinder operation.

before attempting to start the engine.

Hopefully, when the engine starts, it will run steadily with the throttle at the quarter-open position as previously set. Most engines will do this, as received from the factory, provided that the idle mixture control or air-bleed screw has not been tampered with. It certainly feels more civilized to be able to start an engine at part-throttle (or even idle) instead of at full throttle.

However, if, at this early stage, the engine will not keep running on a part-throttle setting, it is probably better for the beginner to opt for the once traditional "full throttle" start, as it is much easier to set the primary mixture control (i.e., main needle-valve) first. One can then carefully readjust, as necessary, the idle controls, after which there should be no difficulty in making subsequent starts with the throttle at its idle setting.

The procedure to be adopted varies according to the type of carburetor fitted to the engine and is described in Chapter 9.

Bounced Starts

An alternative method of hand starting a four-stroke often recommended (especially by Japanese manufacturers) is the "reverse-flip" or "bounced start." Here, after priming the engine as described above (sometimes the direct injection of fuel through the exhaust pipe is recommended as an optional method of priming), the prop is brought up to compression, then flipped vigorously *clockwise* (i.e., in the opposite direction to normal rotation) to start.

This procedure has been recommended as being less likely to cause the engine to "bite" the operator and, for this reason, has been favored for beginners and also for others when dealing with very large engines. When the prop is flipped backwards, it rotates through 1½ revolutions and the operator's hand (or "chicken stick") is well out of the way before the partially compressed mixture is fired by the glowplug and the piston is kicked smartly back in the right direction to start the engine.

Hydraulic Lock

A mixture of liquid fuel and air is compressible. Liquid fuel on its own is not. Therefore, if so much fuel is induced into a cylinder that it occupies more than the quite small volume of the combustion chamber on the compression stroke, the piston will be unable to pass over top dead center.

This is called "hydraulic lock" and it can occur if the engine is over-choked or over-primed. It can happen with a two-stroke engine, but is much more likely to occur with a four-stroke because the four-stroke draws its fuel directly into the cylinder, instead of indirectly via the crankcase. If one over-chokes a two-stroke, the excess fuel will simply collect in the crankcase (assuming the engine to be mounted upright) and the worst that will happen, when the prop is flipped, is that the glowplug will be doused by an excessively rich mixture thrown up through the bypass port, to the accompaniment of a sizzling sound. The same treatment with a four-stroke will arrest the movement of the piston and if an attempt is made to start the engine in this condition, serious damage can occur.

It is important, therefore, not to over-choke a four-stroke prior to attempting to start it and to check—as indicated in the starting procedure above—that the crankshaft will pass over top dead center on the compression stroke.

If the engine is equipped with a choke valve, it is essential for this to be reopened before an attempt is made to start the engine. Preferable, in this respect, are choke valves of the spring-loaded self-reopening type as fitted to the O.S. four-stroke engines.

Thrown Props

It is not unknown for model engines (occasionally two-strokes, but more often four-strokes) to perform a somewhat disconcerting trick; i.e., to emit a sharp crack and come to an incredibly abrupt halt. If the prop is not keyed to the prop driver, its inertia usually results in its kicking the prop nut loose and (unless a locknut is used) the whole assembly; prop nut, washer and propeller disappears in a flash. At one moment the engine is running at several thousand revolutions. One second later, it is station-

(Continued on page 90)

How To:

by RANDY RANDOLPH

MAKE A PLASTIC FUEL TANK

Even though there are a wide assortment of fuel tanks offered by hobby manufacturers, there are times when space considerations call for a tank size that is not readily available. The medicine cabinet or laundry room may hold the answer! Plastic bottles from 1 ounce to a quart, with caps of less then 1 inch in diameter, make great fuel tanks. The pictures show the way.

1. The needed materials are a plastic bottle with a ¾-inch neck and a tank accessory kit (available from your local hobby shop), a screw driver, a razor knife, and a length of fuel tube.

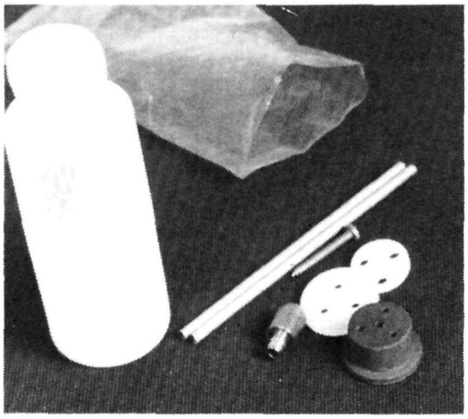
2. Cut the neck from the bottle at the shoulder. Don't rush. Let the knife do the work; rock the knife parallel to the cut and it will almost glide through the plastic.

3. Trim the inside of the hole in the top of the bottle until the stopper in the accessory kit will just slip through: not a tight fit, but a sliding fit.

4. Assemble the accessory kit following the instructions that come with it. Slip the assembled unit into the bottle to check location of fuel pick-up and overflow.

5. Use the bottle as a template to mark the balsa sheet cradles that will become the tank mount. The size balsa sheet will depend on the volume of the tank, ⅛-inch wood for smaller tanks and 3/16- to ¼-inch for the larger ones.

6. The completed tank can be mounted between fore and aft restraining crosspieces and foam blocks. The brass tubing should be trimmed to about ⅜ inch in length for the attachment of fuel lines.



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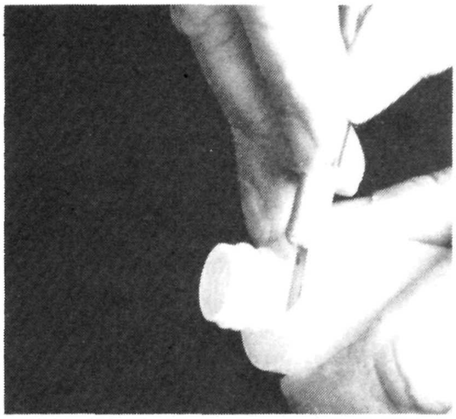

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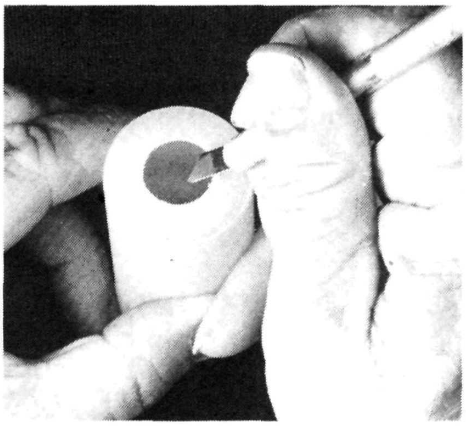

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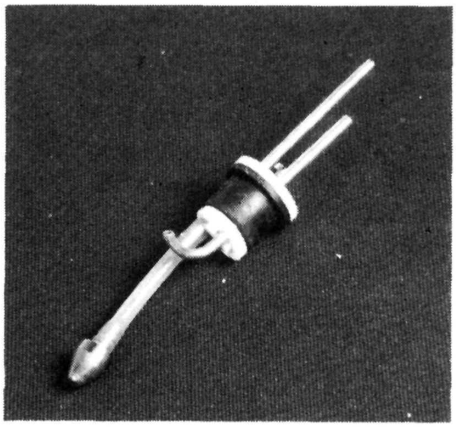

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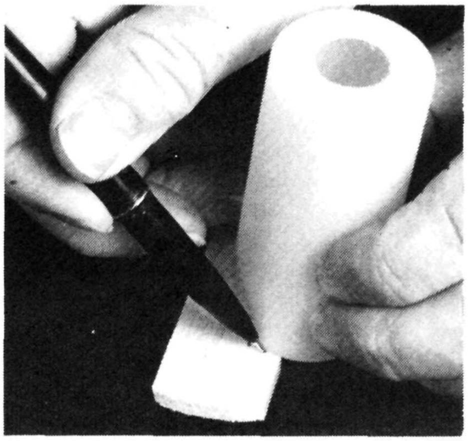

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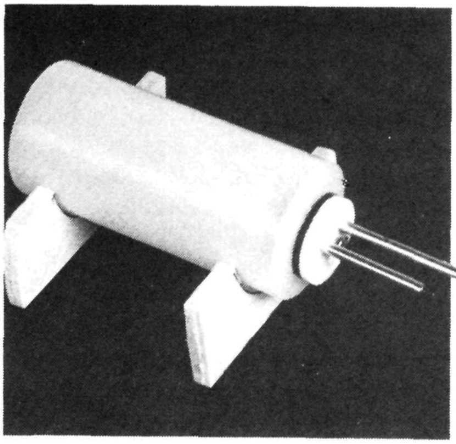

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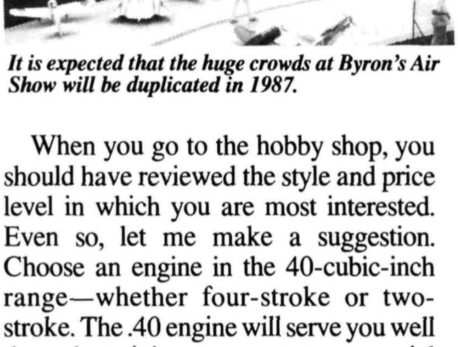
R/C News

by ART SCHROEDER

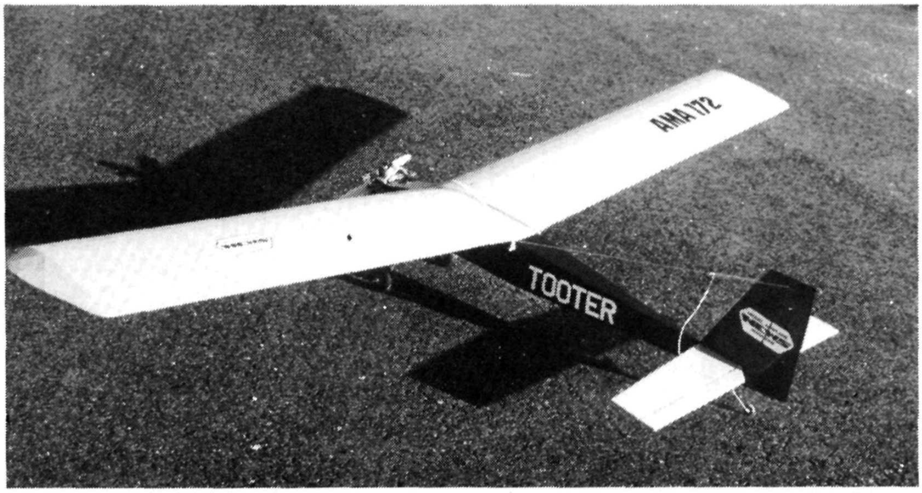
NINETY PERCENT of all model airplanes flying over fields in this country started life as a kit of materials. Of those kitted airplanes, perhaps 80% are built-up and 20% are ARFs (almost-ready-to-fly). Which leads me to my most frequently asked question, "How do I pick a kit?"

One picks a kit based on level of achievement, desired engine size, feeling for a given airplane, and success that other fliers have had with a certain kit. A decision is made after reading ads and product reports, and having discussions with modelers at the field and the local hobby dealer. The type of airplane chosen (low- or high-wing) is dependent upon one's position on the learning curve. Typically, beginners start with a high-winger and the wing moves down as their skills improve. But this is not set in stone; I've seen some fine trainers that were low- or mid-wing and I know some very hot high-wing birds.



It is expected that the huge crowds at Byron's Air Show will be duplicated in 1987.

When you go to the hobby shop, you should have reviewed the style and price level in which you are most interested. Even so, let me make a suggestion. Choose an engine in the 40-cubic-inch range—whether four-stroke or two-stroke. The .40 engine will serve you well through training to sport, to potential competition! It is no wonder that "forties" are the most popular engine size. I suggest you look at the ".40 Engine Shoot-



Tooter, a past Field & Bench subject, has had extensive flying and continues to prove to be an outstanding trainer. This one powered by Thunder Tiger .15.

Out" in our May 1987 issue. From that article, one can decide on the level and price with which you feel comfortable. The .40 engine powers airplanes that aren't large yet give a "big" feeling in flight. Forty-powered aircraft can be flown in just about any wind condition in which you might trust a .60; they don't "flit" around as do some smaller airplanes.

You should also look at built-up airplanes. ARFs have a definite place in our hobby/sport, but more can be learned from "rolling" your own.

One should inspect a kit before buying it. While manufacturers strive for consistency, there are variations in wood and you want to look for hard, straight-grained spars, softer materials for blocks, and medium wood for formers and ribs. Look at die-cutting—you'll want cleanly cut parts with no apparent crushing at the edges. Look for hardware completeness, keeping in mind that anything included reduces your costs as you move to kit completion. And it's good to know that many manufacturers will replace unsatisfactory or missing parts in their kits.

Review the plans carefully. Try to visualize the kinds of construction involved and whether you feel you can complete the work. As a beginner, you probably will be most comfortable with a kit that employs sheet sides and tail surfaces. Multi-stringer fuselages and built-up tail surfaces take more time and require more skill. Keep in mind that sheet wood members are more easily repaired than built-up sticks. Don't avoid a challenge, just be sure you can finish the job. There are enough unfinished kits already in America's workshops!

Review the instructions. This is the area of greatest improvement in kits of this past decade. Instructions with multiple photos or diagrams and clear language can really ease the task of building an airplane. Virtually all major kit manufacturers have upgraded plans and instructions to a level that makes building an easy and enjoyable chore for all beginners. Indeed, instructions in many kits today are really courses in model building!

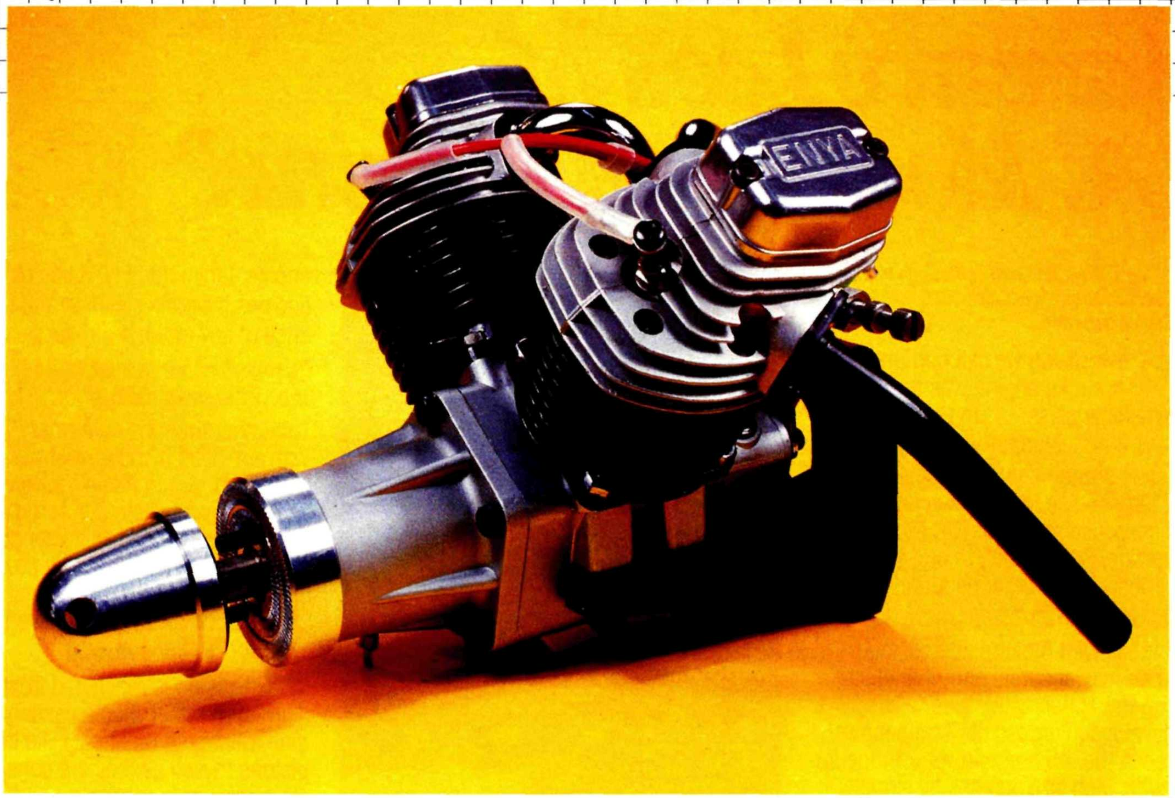
We're living in a space age so don't shy away from kits that include molded-plastic parts for turtle decks, wing tips or cowls. Such parts are light, stand up well, and really cut down on building time.

Most kits include a listing of items needed to complete them. Before you leave the hobby shop, pick up those hardware, adhesive and covering materials. Having everything on hand makes the

(Continued on page 106)

Engine Review

by PETER CHINN



SPECIFICATIONS

Type: 80-degree vee-twin cylinder glow-plug ignition four-stroke-cycle with pushrod operated overhead valves. Overhung crankshaft mounted in two ball bearings. Twin camshafts supported in bronze bushed bearings. Timing shaft supported in two ball bearings. Twin carburetors.

Checked Weight: 1.71 kg (3.78 lb) including cast aluminum firewall mount.

Displacement: 39.85cc (2.432 cu in.)

Bore: 31.0 mm (1.220 in.)

Stroke: 26.4 mm (1.039 in.)

Stroke/Bore Ratio: 0.852:1

Nominal Compression Ratio: 7.2:1

Performance Data (as tested):

Power Output, gross: 3.55 bhp at 11,200 rpm

Torque, gross: 375 oz-in. at 7,700 rpm

Equivalent b.m.e.p.: 121 lb/sq in.

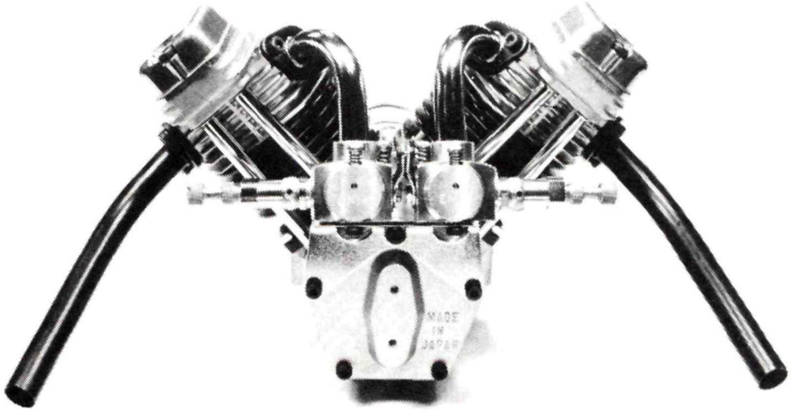
Specific Output, gross: 1.45 bhp/cu in.

Power/Weight Ratio (with mount): 0.94 bhp/lb.

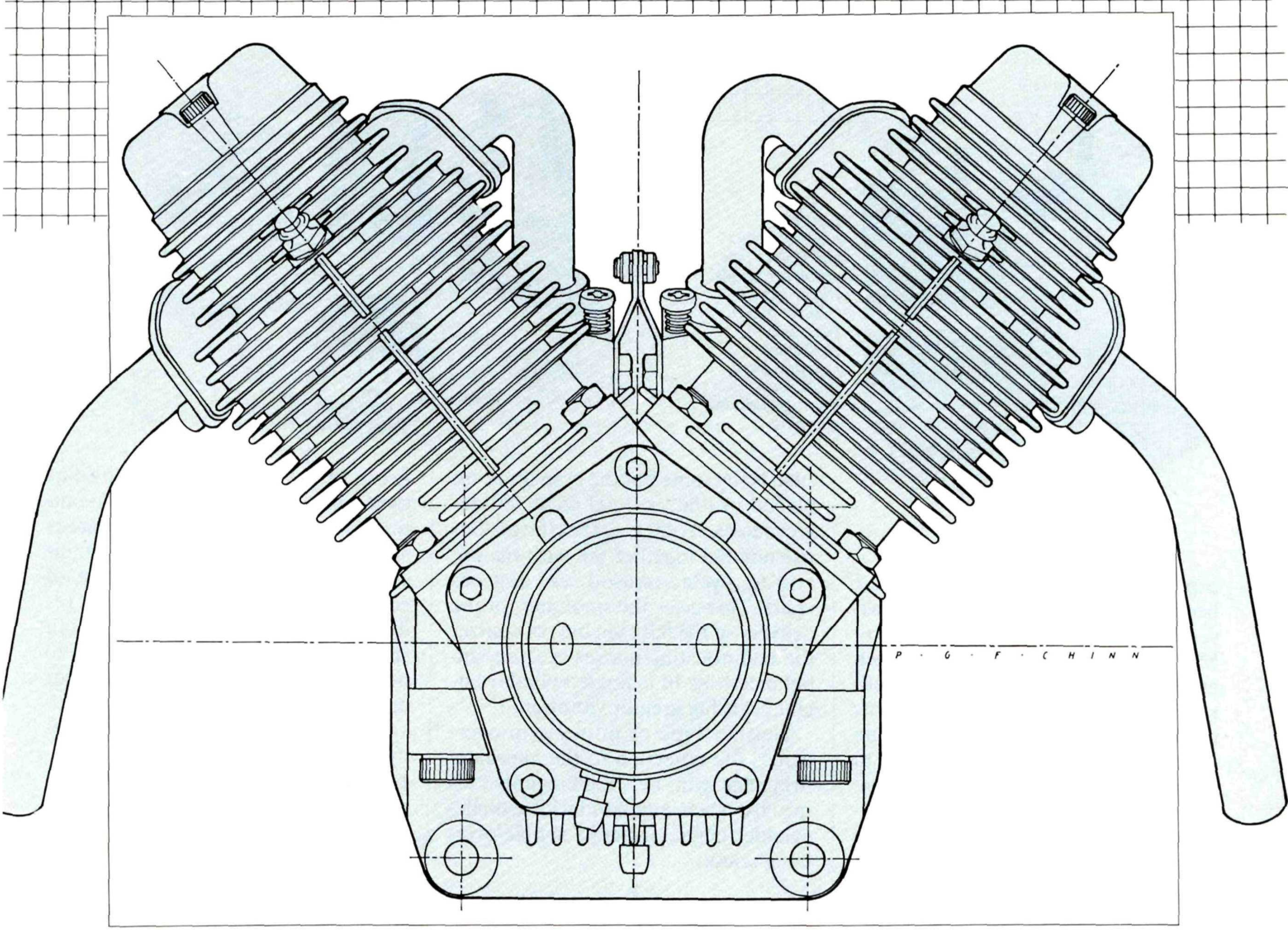
Manufacturer: Enya Metal Products Company Ltd., Nerima-ku, Tokyo 176, Japan.

U.S. Distributor: Altech Marketing Inc., P.O. Box 286, Fords, NJ 08863.

Enya VT-240

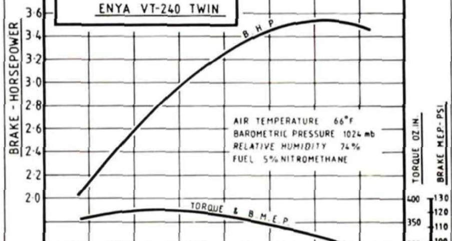


Rear view of VT-240 with mount removed. Angle of exhaust pipes can be changed to suit installation.



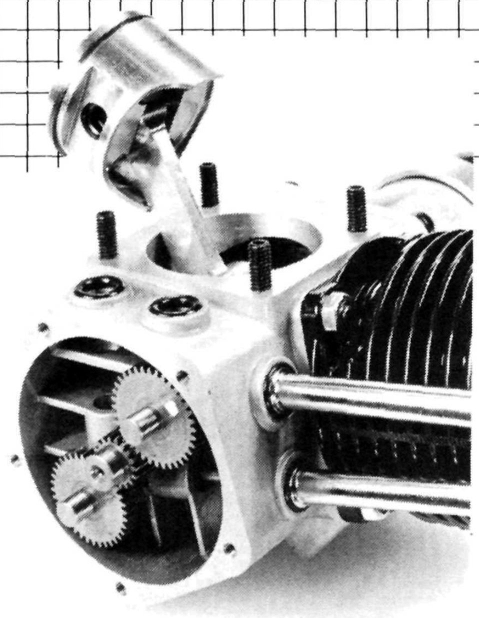
AT THE present time, the most powerful single-cylinder model four-stroke-cycle engines in actual production are limited to a 20cc (1.2 cu in.) maximum displacement. They include such engines as the Enya R120-4C, OPS 20-4 OHC, O.S. FS-120 "Surpass" and Saito FA-120 "Special."

Single-cylinder four-strokes of larger displacement are apt to produce unacceptable levels of vibration. As we remarked in our preliminary coverage of the Enya VT-240 (*M.A.N.* December 1986), there are two reasons for this. Firstly, it is impossible to balance a single-cylinder engine properly. Secondly, as a single-cylinder four-stroke engine fires only once for every two revolutions of its crankshaft, each vigorous expansion stroke is followed by three idling strokes and this produces immense fluctuations in torque. Such unevenness is only partially smoothed out by the flywheel action of the propeller and adds further to vibration levels.

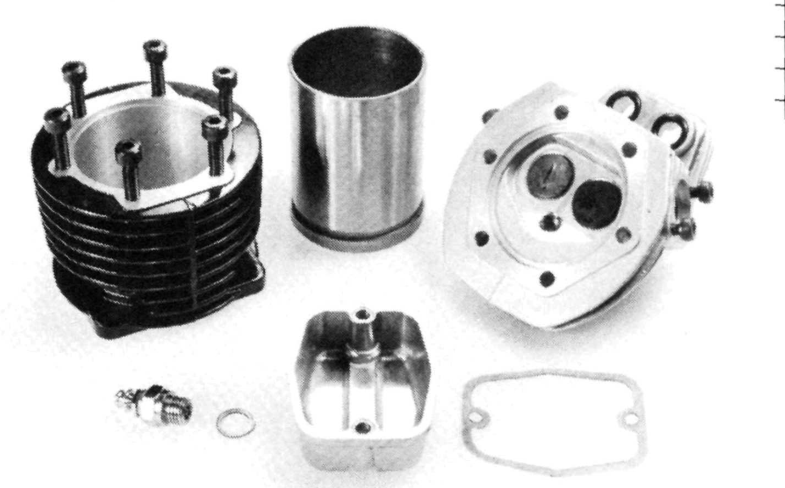


The most obvious answer to this problem is to use two cylinders instead of one; the cylinders being laid flat, either side of the crankshaft, with the pistons coupled to opposed cranks. With such an arrangement, reciprocating masses are precisely balanced (except for the very slight rocking couple caused by the need for the cranks to be placed one behind the other) and the engine runs infinitely more smoothly. In addition, by timing the valves to cause the two cylinders to fire alternately, torque impulses occur every 360 degrees of crankshaft rotation, instead of every 720 degrees, maximum-to-mean torque is halved and a further contribution is thereby made to overall smoothness and refinement.

This refinement has to be experienced to be fully appreciated. The horizontally-opposed twin, with 360-degree firing intervals, is a vastly more pleasant engine to operate than a large single-cylinder four-stroke. Unfortunately, it is also a great deal more



Left: The camshaft gears and slipper-type piston are visible. Right: Finned cylinder jacket, left, with clockwise: cylinder sleeve, head, rocker box cover, gasket, and glowplug.

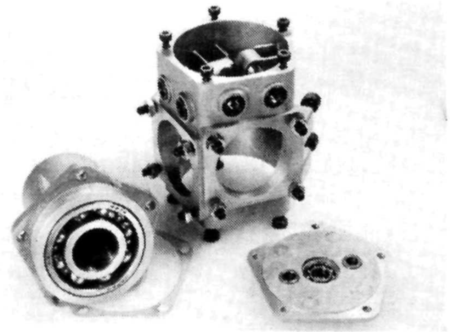


expensive to produce. This is not just because it has two cylinder/piston assemblies, two sets of valve gear, etc. More significant is the fact that such an engine is much more complicated, requiring an expensive two-throw crankshaft with carefully aligned main bearings at both ends, a crankcase to accommodate them and special connecting-rods having detachable bearing caps. Moreover, assembly time and, thus, labor costs are also substantially increased. Current examples of the horizontally-opposed four-stroke twin include the Kavan FK-50, Saito FA-270T and, of course, the four "Gemini Series" O.S. twins, the FT-120, FT-160, FT-240 and FT-300.

As an alternative to the horizontally-opposed layout, a twin-cylinder engine may have its cylinders upright and in line on a longer crankcase. With the crankpins placed at 180 degrees, the weight of one piston/conrod assembly will then be balanced by the other. However, since, in a four-cylinder engine, each cylinder fires only once every two revolutions of the crankshaft, torque impulses, while reduced in magnitude compared with a single-cylinder engine, will not be equally spaced but will occur at intervals that alternate between 180 degrees and 540 degrees of shaft rotation.

To restore torque impulses to regular 360-degree intervals, the inline twin can be modified to the so-called parallel-twin layout. External appearance is the same but the crankpins are placed in line, instead of at 180 degrees to each other, so that the pistons rise and fall together but with the operating cycles phased 360 degrees apart. This gives the smoother torque delivery of the flat twin but, of course, the reciprocating masses are now unbalanced, as in a single cylinder engine, causing greater vibration.

Neither type of inline twin overcomes the objection to the alternate-firing flat twin: i.e., high manufacturing cost when compared with a single-cylinder engine having a simple overhung crank.



Crankcase, front housing, and backplate. Ball bearing in backplate is for timing shaft.

There is just one option that overcomes the major shortcomings of the single-cylinder engine without the complication of a two-throw crankshaft or the need for bearings at both ends. This is the vee-twin in which the cylinders are arranged in a "V" formation when viewed from the front or rear, and in which both connecting-rods are coupled to the single crankpin of an overhung crankshaft like that of a single-cylinder engine.

A vee-twin does not have the equal firing intervals of a two-crank flat twin—in a 90-degree vee-twin the intervals are, alternately, 270 degrees and 450 degrees of crank rotation, instead of every 360 degrees—but, of course, with torque fluctuations reduced, this still produces much smoother power delivery than the 720 degree intervals of a single-cylinder engine. An even more important advantage, compared with the single-cylinder engine, however, is the vee-twin's improved balance. This is because the two sets of reciprocating parts, moving at right angles to each other, result in primary unbalanced forces that combine to produce a constant radial revolving force and this can be balanced by a counterweight on the crankweb diametrically opposite the crankpin.

So far as production model two-cycle engines are concerned, the vee-twin configuration was first used by the 1.2 cu in. Schillings PL-Twin made several years ago in Germany and, afterward, by the 1.8 cu in. British Magnum 182-V. The layout is currently employed by the Laser 120-V and 150-V engines, also made in England, and by the Japanese Enya VT-240 that is the subject of our present report.

The Enya VT-240 is the first vee-twin four-stroke to be tested for *M.A.N.* Let's first take a look at its construction.

CRANKCASE. The crankcase, which also embodies the timing case, has a pentagonal external cross-section and is an aluminum alloy pressure casting. It incorporates four beam mounting lugs, located below, rather than on, the engine's centerline. Each

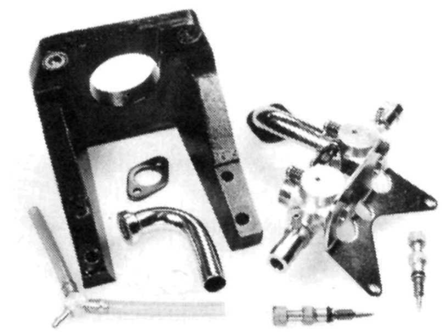
Left: Vee Twin layout permits use of a simple single-crank overhung crankshaft.

Valve operating gear showing timing shaft, camshafts, cam followers, rocker arms, and pushrods.

of these lugs is drilled and tapped with an M5x0.8 metric thread for attachment to the separate firewall mount supplied.

The interior wall dividing the crank chamber from the timing case is fitted with two bronze bushes to support the front ends of the two camshafts which, in order to serve both cylinders, are placed one above the other. The dividing wall also houses the ball-bearing supporting the front end of the timing shaft.

CRANKSHAFT, BEARINGS & FRONT HOUSING. The hefty one-piece counterbalanced crankshaft has a 17 mm diameter main journal, bored 12 mm to reduce weight, and a 12 mm



Cast aluminum engine mount with partially diassembled carburetor/inlet pipe assembly.

diameter front journal, plus a 10 mm diameter hollow crankpin on a 12.4 mm thick crank web. The two steel caged ball journal bearings supporting the shaft are contained within a pressure cast front housing secured to the crankcase barrel with five 4 mm hex socket head cap screws. The bearings consist of an NSK 17x40 mm rear bearing and an NSK 12x32 mm front bearing, the latter being retained by a large internal circlip.

CYLINDERS. Each of these consists of a pressure cast aluminum alloy finned jacket into which is fitted a thin-walled hardened steel liner. The liner has a wall thickness of 1.2 mm and is located in the jacket by a 2 mm wide flange at the top. The liner o.d. projects 6 mm below the cylinder base flange to center the cylinder in the crankcase. Four 4 mm studs and nuts are used to secure each cylinder assembly to the case.

The cylinders are slightly staggered, i.e., the axis of the left cylinder is located 6 mm behind that of the right cylinder. This is because a pair of conventional conrods, rather than a fork-and-blade arrangement, is used. Having the cylinders mounted on the crankcase at an 80 degree (rather than 90 degree) included angle, results in a marginally narrower and more compact engine and also gives slightly more even firing intervals.

PISTON/CONROD ASSEMBLIES. In common with the cylinder liners, the pistons are the same as those installed in the standard single-cylinder Enya 120-4C. They are of the slipper type, machined from high quality piston alloy and each is equipped with a single conventional compression ring. In the interests of low reciprocating weight, a short (21.2 mm) but well supported tubular wristpin is used and is retained in the recessed piston bosses with wire snap-rings. The wristpin has a 7 mm o.d. and an i.d. of 5 mm. Each piston and ring weighs a modest 15.5 grams, which is increased to only 18.7 grams with the wristpin added, keeping reciprocating weights to a minimum for smoother operation.

The connecting-rods are machined from high-duty aluminum alloy bar stock and are bronze bushed at both ends. Since the big-end bearings of both rods have to be accommodated, one behind the other, on a single crankpin, bearing width is limited to 6 mm for each rod but adequate bearing area is ensured by the relatively large diameter (10 mm) of the crankpin. At the wristpin end, the rod bearing is 8 mm wide. A single oil-hole is used at the lower end of each rod. The rods weigh 8 grams each and are quite short at 43 mm (1.629 x stroke) between centers. This, combined with the engine's fairly low stroke/bore ratio, has helped to lower overall engine height.

CYLINDER HEADS. These are similar in design to other recent Enya cylinder heads, except that, due to relocation of the ports, it has been possible to use six equidistantly spaced head screws, rather than five irregularly spaced ones. The combustion chamber shape is the familiar modified bathtub pattern, having squish areas front and rear, with an angled glowplug hole at the front. Following orthodox model four-stroke practice, the heads contain bronze valve seats and guides and the inlet and exhaust valve throats are the same size (10 mm

(Continued on page 100)

by JOHN SULLIVAN

Basics of


Gary Gleffe's ¼-scale Saito 270-powered Decathalon at rest; 19-pound plane is amazingly realistic and docile.

A STORY appeared recently in *Readers Digest* which is worth passing on. It concerns a full-scale pilot who had grown tired of the long drive from a rural airport to his lakeside weekend cabin. Since there was a floatplane port near his main residence, he decided to equip his plane with floats and fly direct.

On his first trip, the guy turned on final at the airport in the usual manner when his wife screamed, "Are you crazy? You can't land this thing here!"

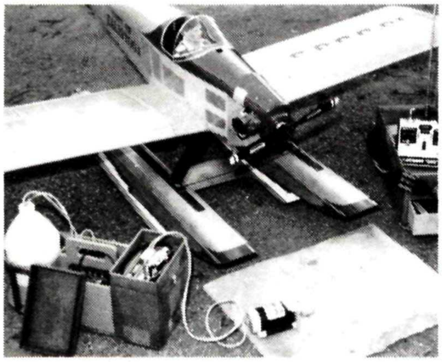
Narrowly avoiding disaster, our aviator flew on and landed the plane at the cabin. As he shut down at shore's edge, visibly shaken, he turned to his wife and said, "That's the stupidest thing I've ever done! I don't know what got into me," and with that, he stepped out of the plane and fell in the water.

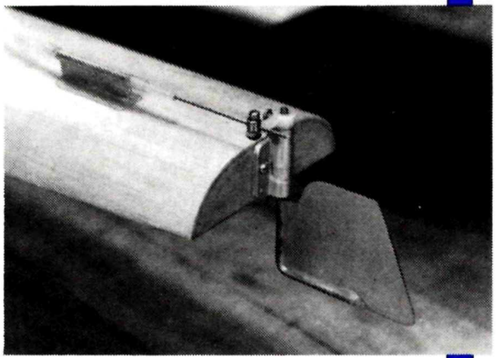
Obviously, there are couple of items to keep in mind when flying full-scale floatplanes, and although as modelers we may watch our narrowly avoided disasters in safety from the shore, we still have some concerns regarding the proper setup and operation of our aircraft.

The first order of business is to select a set of floats which is properly sized to the plane. Balsa USA*, Proctor*, Bridi*, Top Flite*, and others have float kits available for certain planes in their line. You'll also find float cores and blow-molded types listed in the Tower Hobbies* and Hobby Shack* catalogs. The best way to determine if a commercially available float will suit your plane is to multiply the fuselage length (prop washer to rudder hinge line) times .80 and buy accordingly. Unfortunately, the floats that are manufactured don't come in a broad enough range of sizes to accommodate every plane, and for that reason, we've included a plan to help you make your own.

The calculations shown will produce a float almost directly proportioned to the EDO 1650A series. The step is located at the 50% position to handle weight distribution and the volume will provide an 80% buoyancy factor in most cases, which follows full-scale FAA requirements. To determine the float dimensions, multiply the fuselage length by .80. This

Float Flying





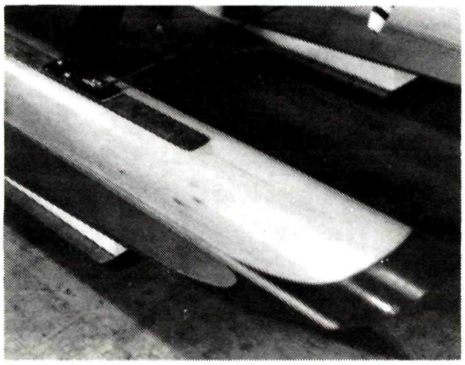
Left: ¼-inch ply and foam stand protects floats, yet leaves model free for repairs. Right: Water rudder utilizes modified Du-Bro nose wheel gear and tiller.

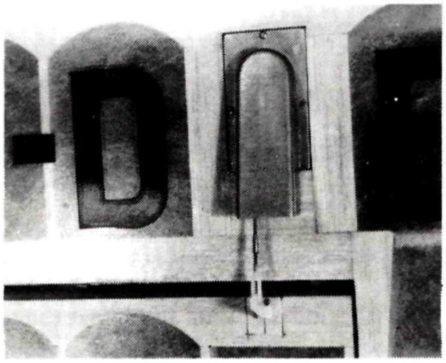
gives "L" (or length of float). Every other dimension is taken as a percentage of L. For example, the distance from the bow to the step on a 36-inch float will be 18 inches, or 50% of L. For those of you who don't regularly work with decimal equivalents of inches, just remember that .125 equals ⅛-inch, rounding off to the nearest ⅛-inch is more than close enough.

There's one exception to the above formula, which occurs because the float step must be under the CG and the float bow must extend past the prop at least 2 inches to overcome digging in when throttling up. Because nose moments vary from plane to plane, it sometimes becomes necessary to move the 33% breaking point on the forward bottom portion of the float until you have the required extension, and then redraw the profile. This method is preferable to designing a proportionately larger float simply to satisfy the 2-inch extension requirement.

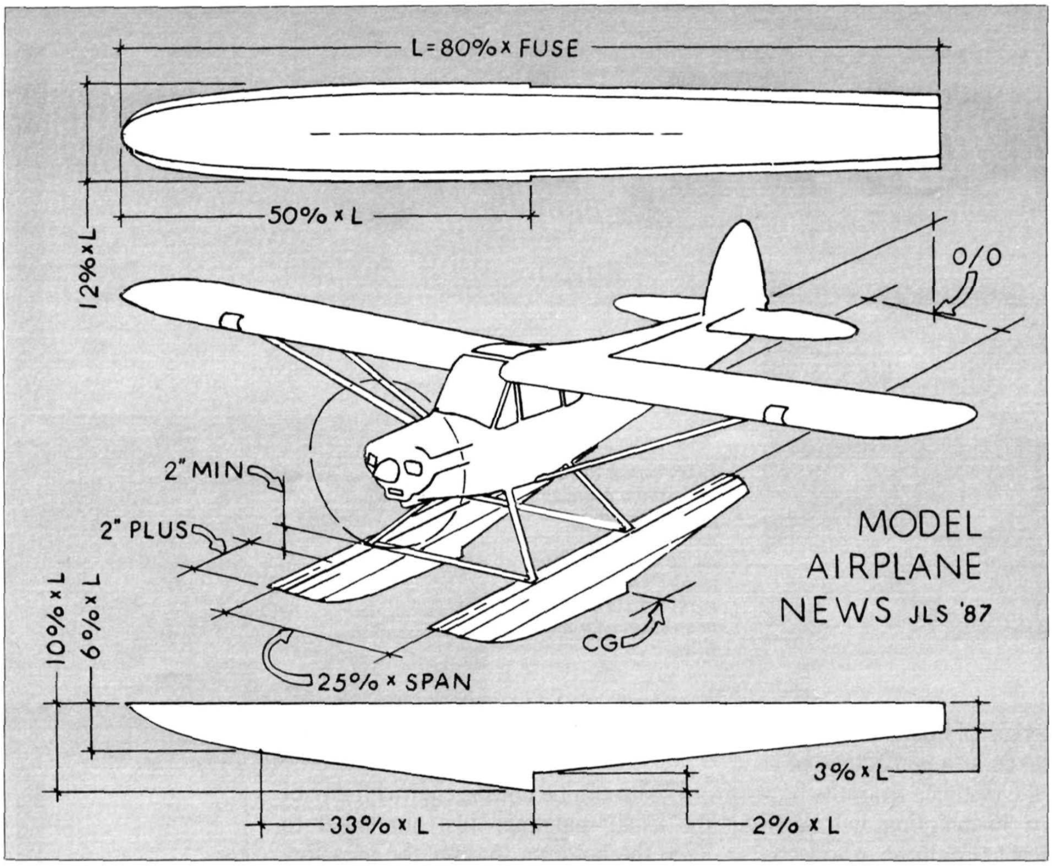
Floats can be constructed with any of the usual materials. Just remember to keep the bottoms smooth, the area forward of the step perfectly straight, and the edges sharp. Floats with vee bottoms track better and produce somewhat smoother runs and landings, but they also increase wetted surface (drag), are less maneuverable (keel effect), produce more spray, and are more difficult to build. The weakest points on a float are generally the side area above the step and the strut attach points, so it's wise to add reinforcements to these areas to spread the load.

Finally, the dimensions shown on the plan will support any average to heavy weight plane. For example, a 48-inch set can support a 23-pound aircraft without burying the stern. However, if you are equipping a plane above or below normal weights, you can juggle sections with lengths (i.e., a 46-inch long float with a

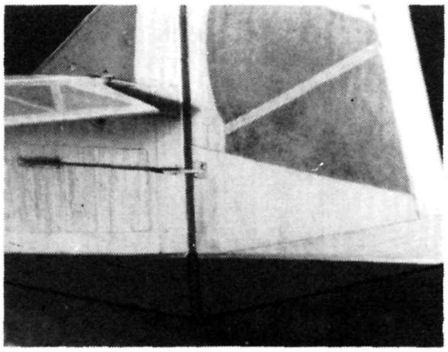




Far left: Sheeted foam core floats with ⅟16-inch ply rub rail. Left: Splash guard protects aileron servo.



34-inch float section) to build a float that looks right on the plane yet provides the proper buoyancy. What looks right usually works. But, if you want to calculate flotation, figure that for every cubic inch of float below the waterline

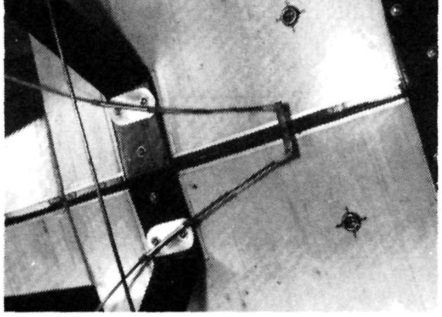


Outline denotes sub-fin add on. Rudder pushrod is above splash pattern and requires no guard.

you'll be able to support .036 pounds. If you like working in metric, 1 cubic centimeter displacing 1 gram will get you close enough.

The second, and just as important step in outfitting a floatplane, is establishing the attitude at which the floats will be mounted in relationship to the plane. In full-scale applications, the floats are hung with 3° to 4° of incidence negative to the normal flight attitude of the plane. In other words, the floats are pointing down slightly. This is done in order to present a high angle of attack at takeoff because of power restrictions, but it's done at the expense of creating drag at the "mouth" or open area between the floats and the fuselage.

Fortunately, model floatplanes have a much higher power-to-weight ratio than full-scale planes, so the goal is to mount the floats parallel to the normal flight attitude using the float decks as reference. With a setup like this, and using the float



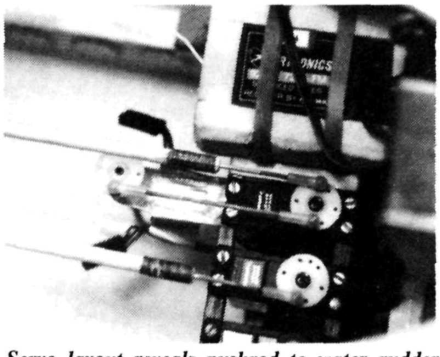
Composite gear mounts directly to fuselage hard points. Note graded rudder cables.

proportions shown on the plan, it's possible to power off in a short run without burying the stern, or run at very high speeds with only a fraction of the step making contact with the water.

Bear in mind that the greatest contributor to water looping (second only to inadequate air rudder area) comes from increasing the wetted area forward of the center of gravity. An excellent example of this can be observed by comparing the ground handling characteristics of trike gear as opposed to taildragger setups.

In many cases, the normal flight attitude of a plane can be determined by paralleling the incidence of the horizontal stabilizer. Lifting stabilizers, the effects of prop wash and turbulence, and scale setups which don't perform the same when downscaled, can add to the confusion. But the point is, if you take the time to study the situation and employ common sense, you'll be in the ballpark.

(Continued on page 110)



Servo layout reveals pushrod to water rudder wheel and post, which exits through a brass tube.

Float Flyers' Buyer's Guide

by JOHN SULLIVAN and CHRIS CHIANELLI

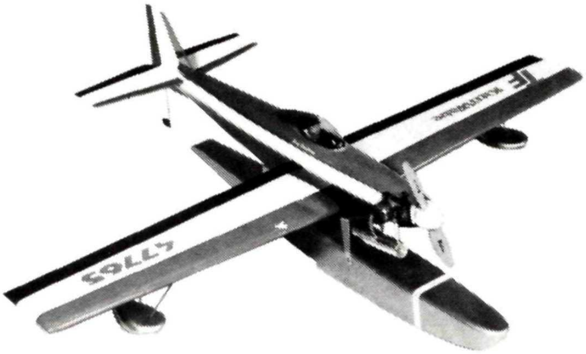
FLOAT FLYING is, so to speak, on a roll. It currently ranks seventh in preference out of fifteen categories of R/C flying activity and each month's newsletters brings more reports and announcements of float-flys across the country. Just the sight of a floatplane blasting through a swell with the roostertail being blown to mist is enough to make most modelers give it a try, but there's a practical side to all of this also.

Floatplanes last longer than their land-bound cousins. Detractors may tell you that water is just as hard as terra firma *at 60 mph, but if this were really the case, pelicans would dive for gophers too. Then there's the incredible spectacle of float flying, the spreading wake as you taxi out for your first flight of the day, the aesthetically balanced appeal of a floatplane soaring overhead, and the delight in watching the plane meet its reflection on that perfect touchdown. But most important is model aviation's continuing loss of flying sites and the impact such losses will have on the hobby. Wouldn't it be a fitting turn if the loss of a flying site "forced" us to turn to something immeasurably better?*

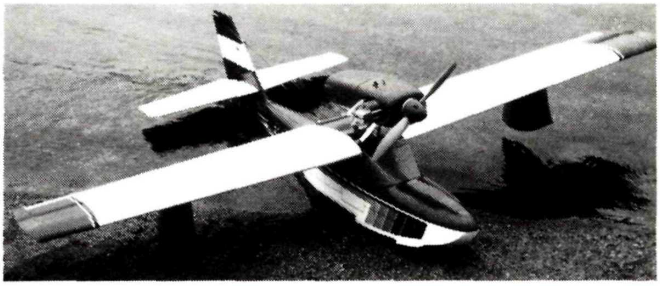
Because the flying of model floatplanes is in its infancy, Chris and I have compiled a partial list of float manufacturers to assist you in outfitting your first floatplane. For a rule of thumb, use 80% plus-or-minus of the fuselage length to determine the float length you'll need. Some of the manufacturers list their floats by engine size, so it may be necessary for you to contact them regarding length.

We've divided the products into three categories: floatplane kits, float kits, and float cutters. New floatplane products are appearing every month, so keep your eyes peeled for new developments. Two final reminders: Put this issue under lock and key, and don't forget to tell the manufacturers you heard about them and the great sport of float flying in Model Airplane News.

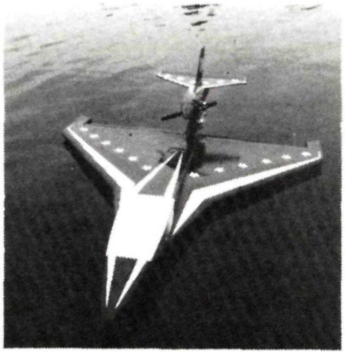
Floatplane Kits



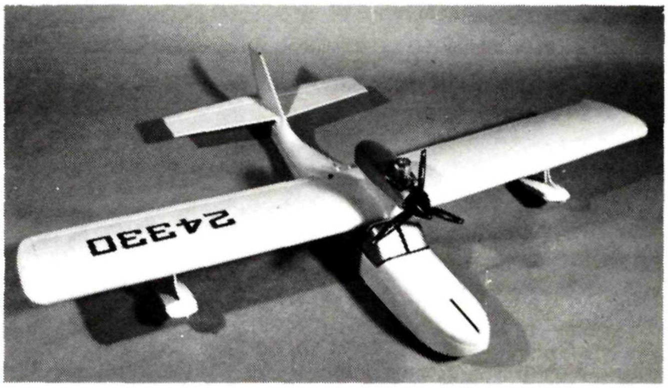
TOP FLITE MODELS (2635 S. Wabash Ave., Chicago, IL 60616) has recently introduced the .25-powered 47-inch span low-wing **Kittywake** ($89.95) which sports a center pylon float and sponsons.



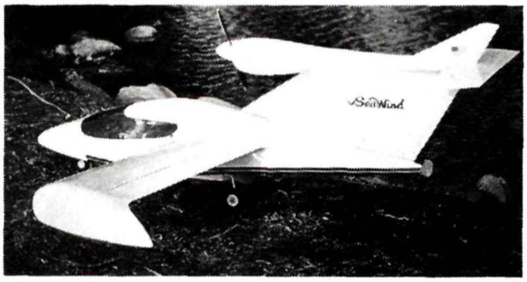
HOBBY SHACK (18480 Bandilier Circle, Fountain Valley, CA 92728) brings its highly successful E-Z concept to an amphibian, the **E-Z Mermaid** ($350.00). Span is 59½ inches, area is 612 square inches, and it's for .40 to .45 two-cycles or .60 to .90 four-cycles.



BALSA USA (P.O. Box 164A, Marinette, WI 54143) kits the sharp-looking **North Star Delta Amphibian** ($57.99 for the deluxe kit), an all built-up kit for .40 to .46 two-strokes. Balsa USA also kits three sizes of floats: .25 and .40 size and floats for a ¼-scale Cub.



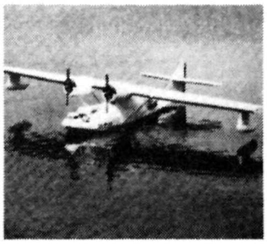
LANIER (P.O. Box 458, Oakwood Rd., Oakwood, GA 30566) kits the **Seabird** ($229.95), a 90% completed ARF that is vacuum-formed out of ABS plastic. With a 60-inch span and a 630-square-inch area, this model can be built in an evening or two. For .40 to .60 two-cycles or .60 to .80 four-cycles.

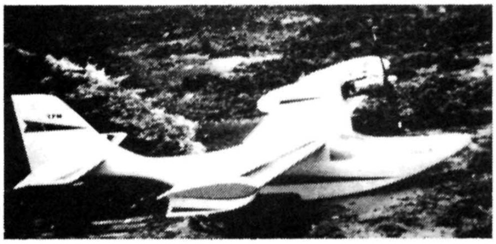


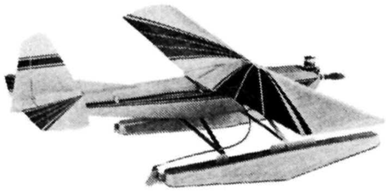
BYRON ORIGINALS (Box 279, Ida Grove, IA 51445) has just introduced the mind-boggling ¼-scale 105-inch **Sea Wind Amphibian** ($928.00). This incredible glass and foam beauty features retractable landing gear, full cockpit, and molded wing-tip floats. Without a doubt, this is the ultimate seaplane.

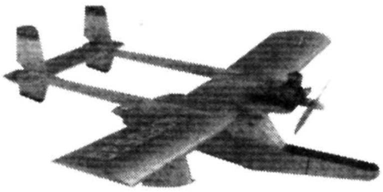
Floatplane Kits

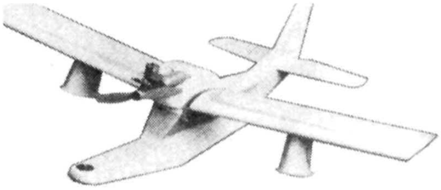
TIGER FIBERGLASS AND MARINE (2320 Wills, Marysville, MI 48040) markets the good-looking **Super Seamaster 60** ($195.00) by Ken Willard. This glass and foam flying hull features a pylon mount configuration for two-stroke engines. Also available are the Grumman Widgeon ($390.00, not shown) and the incredible PBY-5 Catalina ($520.00) in epoxy-glass with sheeted core wings. Both models are powered by twin two-strokes in the .40 to .60 range and feature glass nacelles, sponsons, and rudders, just the thing for twin excitement.







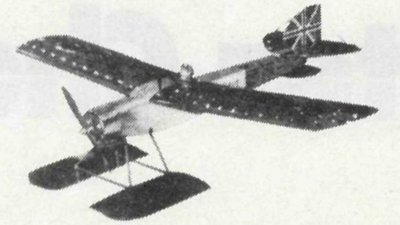




GEE BEE PRODUCTS (through Hobby Shack, 18480 Bandilier Circle, Fountain Valley, CA 92728 and others) markets three floatplane kits in the .20 to .40 range. The 50-inch span built-up **Seahawk** ($62.95) is a high-wing 4-channel stable flyer and includes floats and lightweight gear. The 50-inch span **Mallard** ($60.95) and twin-boomed **Islander** ($61.95) are flying boat kits which employ a single Gee Bee float as the hull structure.

Float Kits

GEE BEE PRODUCTS (through Hobby Shack, 18480 Bandilier Circle, Fountain Valley, CA 92728, and others) makes polypropylene-injection-molded RTF floats in 28-inch ($29.95), and 33-inch ($32.95) lengths. These floats feature deep-vee bottoms and work well on lightly loaded and amply powered aircraft.

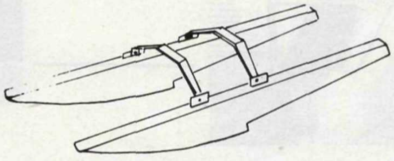


TOP FLITE MODELS

(2635 S. Wabash Ave., Chicago, IL 60616) Elder Float Kits are simple-to-assemble floats designed for the Top Flite Elder. Since the Elder is a taildragger, three floats are included in this set. Suggested price is $20.95.

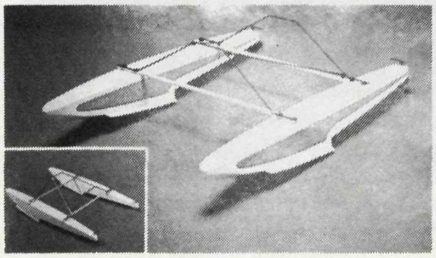
SIG MFG. CO.

(Montezuma, IA 50171) kits a 48-inch built-up vee-bottom float for ¼-scale planes in the 12- to 25-pound range. These well-designed floats come complete with wire gear, rudders, and instructions for mounting on Sig's Great Cub.



B.J. FOAM FLOATS

(through Tower Hobbies, P.O. Box 778, Champaign, IL 61820) manufacturers 32-inch ($16.00), 40-inch ($23.25), and 48-inch ($31.50) vee-bottom floats for size .40, .60, and .90 planes. These floats have moderate flotation and can be sheeted or epoxy-glassed.



HOBBY SHACK (18480 Bandilier Circle, Fountain Valley, CA 92728) carries the Pilot built-up float kits in sizes .19 to .25 ($31.99) and .40 to .45 ($37.99). These are well-designed, splash-railed vee-bottom floats which come complete with adjustable gear and rudders.

CIRCUS HOBBIES (3132 S. Highland Dr., Las Vegas, NV 89109) has two easy-to-build balsa float kit offerings. The suggested retail price is $39.95 for .40- to .60-size floats, and $49.95 for .90- to 1.20-size floats.

PROCTOR ENTERPRISES (25450 N.E. Eilers Rd., Aurora, OR 97002) has three-point Old Timer float kits for the Antic and Antic Bipe. Contact Proctor for adaptability to other aircraft.

NORTHEAST AERODYNAMICS (61C Lebanon St., Stanford, ME 04073) kits a 32-inch flat-bottomed balsa and veneer foam core float. These flat-bottomed floats are very stable and maneuverable.

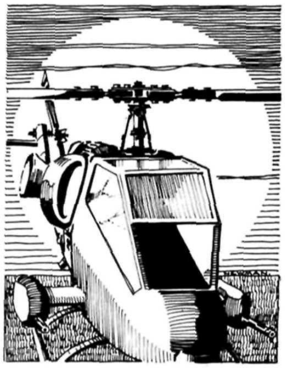
SUREFLIGHT FOAM FLOATS (through Tower Hobbies, P.O. Box 778, Champaign, IL 61820) manufacturers a flat-bottomed 38-inch molded-foam float which comes with mounting brackets and hardware. It's a good float companion for many of their kits and others. Suggested price is $20.95.

Float Cutters

BILL GRESHAM (P.O. Box 840, Clearlake Oaks, CA 95423), excellent foam core floats hot-wired in a variety of sizes. Bill's flat-bottomed floats come complete with imbedded redwood strongbacks. Write for prices and availability.

BILL WESTPHAL (Seattle, WA; 206-771-2564) custom cuts the flat-bottomed super float designed by Dick Hansen of the Portland Skynights. These floats were used on over half the planes at the Northwest Seaplane Championships.

LEN VALLIE (Box 214, Montrose, B.C., Canada VOG 1PO) kits high-performance vee-bottomed blue foam floats in six sizes. Len will also custom cut floats to your specifications. Call 604-367-7465 for more information.



Helicopter Chal

by CRAIG HATH

IN THE PAST few articles we've gotten the process of constructing our model out of the way and we're almost ready for the good stuff, flying! Before getting into that though, let's go over the model one more time.

Now that the helicopter is finished, it's a good idea to get out the construction manual and re-read all the instructions to check for anything that might have been left out or improperly performed. This might sound redundant, but it could save you from disaster! Go over each step as if you were building the helicopter all over again. It's also a good idea to recheck all of the nuts and bolts to make sure none of them are inadvertently left loose. Look for any obvious flaws and be sure that all the gears mesh properly.

Check the controls on your radio and be certain there's no binding or excess slop. Re-check the direction of throw for each control, and become familiar with the effects of each control on the helicopter. Read the radio manual and be sure that you understand how to charge the batteries.

Keep the helicopter a good distance away during the initial trim flights and be extra safety-conscious. These things can hurt you.

Quick study Ken Wilson recently graduated to forward flight with his Kalt Baron 50.

If you're using a gyrosensor, be sure that you've read the instructions for it. Check the gyro for proper direction of operation. This is very important, as the helicopter will be impossible to control if the gyro is giving reverse commands to the tail rotor servo. The best way to check this is to turn on the radio system and move the tail rotor control back and forth. Move the tail rotor stick on the transmitter to the left and observe the direction of servo travel by watching the servo output arm. Move the stick left, then to center, and then to the left again so that you're certain of the direction the servo output arm travels when left tail rotor is given. Now, turn on the gyro and allow it to come up to speed. Adjust the gyro sensitivity to full. Rotate the nose of the helicopter to the right, and watch the tail rotor servo output arm. Repeat this until you identify the direction of servo movement. The rotation of the helicopter will have to be fairly sharp to get a strong input to the tail rotor servo from the gyro. When the nose of the helicopter is moved to the right, the tail rotor servo output arm should move to the left. If the tail rotor servo output is moving to the right, giving right tail rotor, then the gyro is operating backward.

Correcting the direction of the gyro depends on the gyro you're using. If you're lucky, the gyro will have a reversing switch built into it. If this is the case, simply reverse the switch, and re-check the operation to confirm the change. If your gyro doesn't have a reversing switch, you have two options. Before I go into them I must state that even though your radio system might have servo reversing, it will be of no use here. If you reverse the tail rotor servo with the servo-reversing switch on the transmitter, the tail rotor will operate backward. To correct this condition you'll have to move the linkage to the opposite side of the servo output arm. Once you've done this, you'll notice that the gyro still operates in reverse. This is because the gyro sends a signal to the servo amplifier, which tells the servo what direc-

A well-stocked tool box should accompany you to the field—you never know.

lenge

tion to move in. Reversing the throw at the transmitter only reverses the signal at the stick, which makes the servo think the stick is actually being moved in the other direction. If you follow this explanation, you will understand that the servo is wired so that the motor will turn clockwise with one signal and counterclockwise with the opposite signal.

I know what you're thinking now! You're saying that your gyro operates from a separate channel on the receiver. This separate channel allows you to adjust the sensitivity of the gyro from the transmitter, or "in-flight sensitivity" as it is commonly called. You think that by reversing the channel that the gyro operates from it will reverse the direction of the gyro itself. Wrong! This will only reverse the switching direction for the sensitivity control, which means that the sensitivity selection is now reversed. So now let's look at how to reverse the direction of the gyro.

As mentioned earlier, you have two options for correcting the gyro direction. The simplest method is to turn the gyro over so that the top of the gyro case now becomes the bottom. This method works fine, yet some modelers feel that this is hard on the gyro because the bearings which support the gyro itself are positioned so that the case is standing upright. This might or might not be true depending on the gyro. I know that this is the method recommended by some gyro manufacturers, so if the instructions for your gyro indicate that it can be turned over, it should be all right to do so. The second method for reversing the gyro direction is to use a reverse servo. A reverse servo is a servo that has been wired so that the servo will operate in reverse of normal servo direction. Most of the radio manufac-

(Continued on page 115)

Learning Forward Flight

by DAVID TROST

Basic steps to fly proficiently.

AFTER LEARNING to hover, it's time to prepare the machine for forward flight. The tail rotor compensator and the basic pitch power need to be adjusted. Both of these functions can, and should, be adjusted simultaneously but I'll discuss them separately for clarity.

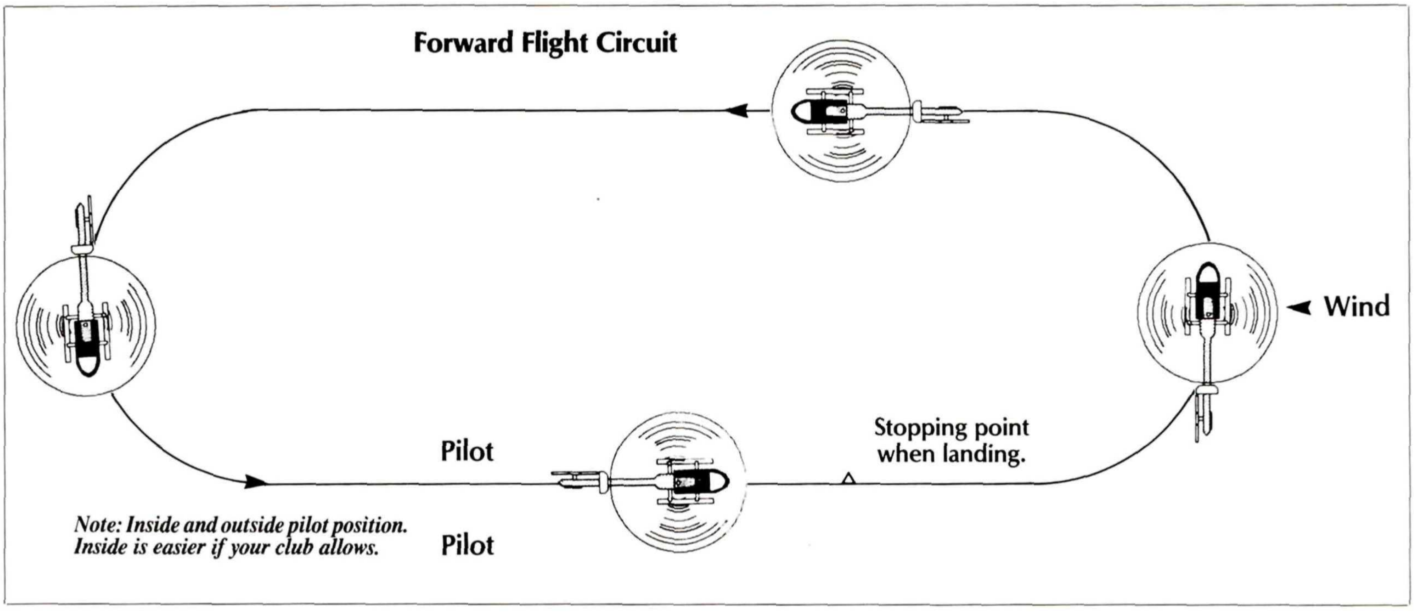
Obtaining the proper pitch/power curve is essential if you want to get maximum performance from a collective pitch machine. The pitch/power curve is the relationship between the engine power and the main rotor pitch. The goal is to have the rotor speed remain constant during most flight modes. I like to keep my rotor speed between 1,650 and 1,700 rpm. Most of the helicopter manufacturers also recommend this range.

The machine should be set up so that it breaks ground at about half-throttle stick. This doesn't mean that the carburetor valve is half open or that the engine is producing half of its maximum power. In most machines the engine will be producing around 60% to 65% of its maximum power output in hover. The pitch/power curve can only be set properly after the machine has been operated in all flight modes. However, the curve can be approximated quite well by a pilot who is only proficient at hovering.

The object of the pitch/power curve is to match the amount of power needed to drive the rotor at a given blade pitch. The ideal curve will be different for every machine, even identical ones. It is affected by many factors: engine output, fuel, humidity, air density, the friction in the mechanics, and a multitude of other things. However, there is one basic concept which never changes: the power should lead the pitch. This rule means that the engine's power output should come up to maximum sooner than the pitch does. If the pitch increases faster than the power, the engine will be loaded down too much and will not be able to produce the torque needed to accelerate the rotor. Keep this general rule in mind and you'll have fewer difficulties in arriving at the ideal curve for your machine.

The first step in setting the pitch/power curve is to set up the machine so it hovers at half-throttle stick with a main rotor speed of 1,650 to 1,700 rpm. This step probably has already been done. Setting the hover point is much easier to accomplish on the higher-priced transmitters since they have various electronic circuits which allow the pilot to adjust the pitch and the throttle at mid-stick without affecting the end-point settings. On machines which are not equipped with an electronic means of warping the pitch/power curve, the adjustments must be made at the helicopter by changing the servo arm positions to create the needed differential throws.

Once the hover point is set, the top-



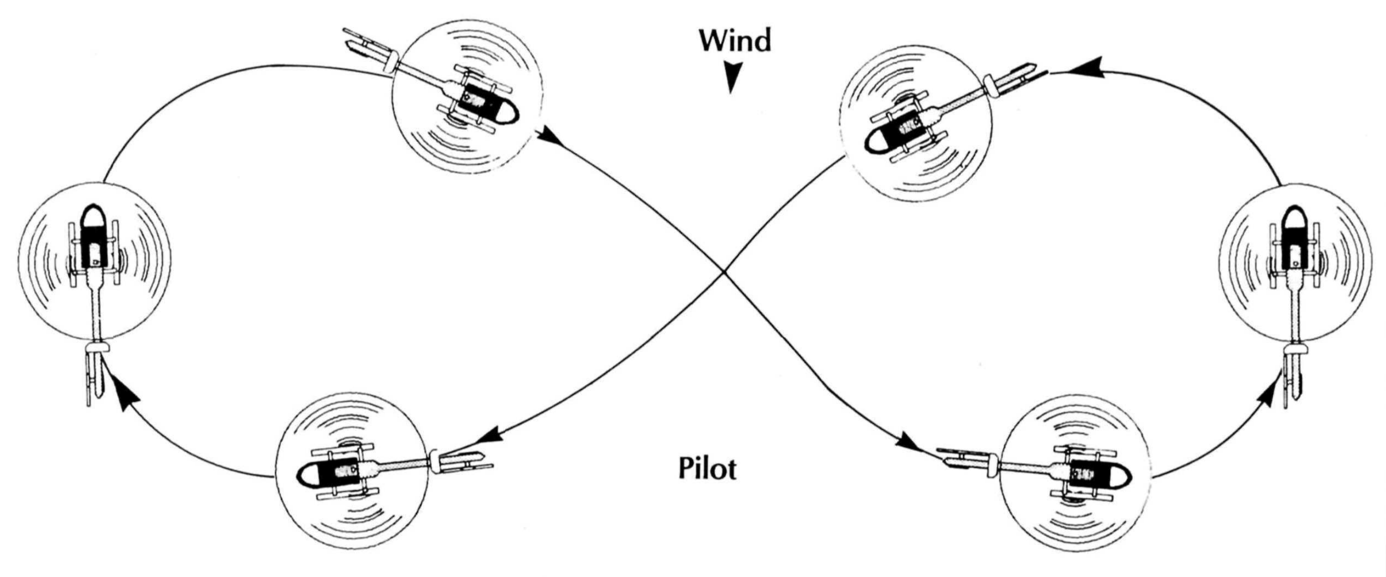
end pitch can be set. Vary the top-end pitch so that the helicopter can climb vertically under full power and not lose more than 50 rpm. The low-end pitch should be set as per the manufacturer's recommendations until you gain a feel for how much negative pitch is needed for smooth descents and autorotations. If there is no recommendation, -3 to -4 degrees is a good starting point. It's important that the throttle be high enough so the rotor maintains speed during a descent. If the rotor slows down too much, directional controls get very mushy. I like to set up my machines so the engine idles at one-quarter to one-half trim. Before a flight, I advance the idle trim to full; at this engine speed the clutch is engaged and the rotor is spinning at about 1,000 rpm. All hovering and flight pitch/power settings are made with the idle trim set at high. This way rotor speed is always maintained during descents. On fixed-pitch machines, the engine response should also be set up so it is linear over the middle portion of throttle stick movement.

The following discussion of tail rotor adjustment only applies to collective pitch machines which have *clockwise* spinning rotors. The accelerator control should be turned off or set to low. The machine should be placed in a hover, the throttle stick should be centered or close to center. Adjust the rudder trim so that the tail stays put, then briskly advance the power and let the machine rapidly climb 15 to 20 feet. Land the machine. If the helicopter rotated to the left, increase the compensator setting; if it rotated to the right, decrease the setting. If your transmitter has separate compensators for up and down, only adjust the up compensator. The down compensation can be evaluated by making a rapid descent and noting the direction of rotation. Adjust the down compensator setting accordingly.

On fixed-pitch machines, make sure the compensator is turned off or set to low. Follow the same procedure as outlined above for collective pitch machines but adjust the *accelerator control.*

Once you become proficient at hovering, it's time to take your first forward flight. This is a time when it's good to have an instructor standing by to help. If you're an experienced fixed-wing flier, learning forward flight will be somewhat easier. When a helicopter is in forward flight, the controls operate like a fixed-wing airplane. However, there are several important differences between fixed-wing flight and helicopter flight. Helicopters are turned primarily with the rudder, and should be banked *very little* in turns. Helicopters with clockwise-rotating rotors turn much better to the right than to the left due to the torque created by the rotor system. One important point to remember is that up elevator input makes the machine climb, but it also slows forward speed of the machine so be gentle on the elevator in turns. If the machine does come to a stop, simply push the stick

Advanced Hovering Exercise



forward to regain some speed.

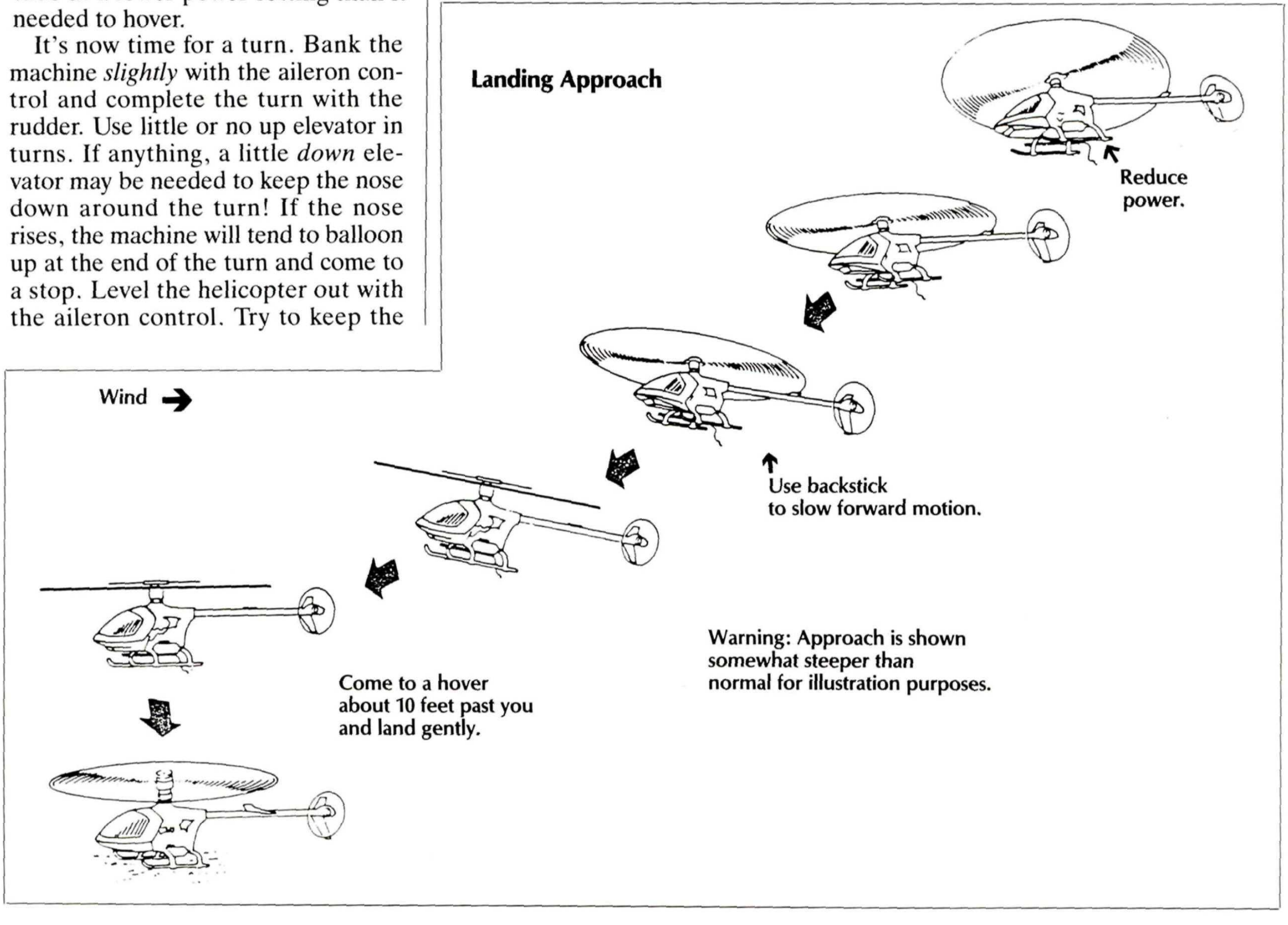
I'd recommend different methods to achieve the first flight depending on whether the pilot has previous fixed-wing experience or if an instructor is present. Get ready for the first flight by hovering out a tank of fuel to make sure that the machine is trimmed out and your hovering skills are tuned. After refueling the helicopter, lift off and hold a hover for a few seconds to let the engine warm up. Point the nose into the wind and gently push the stick forward. As the helicopter starts to move forward, it will start to climb due to the increased airflow over the rotor producing extra lift. If you want to climb out faster, add a little power. When the desired forward flying speed (about 30 mph) is reached, neutralize the elevator stick. The machine will tend to maintain the speed without continuous input. Climb to an altitude of 100 feet and level off by decreasing the power. You'll notice that the machine will maintain altitude at a lower power setting than it needed to hover.

It's now time for a turn. Bank the machine *slightly* with the aileron control and complete the turn with the rudder. Use little or no up elevator in turns. If anything, a little *down* elevator may be needed to keep the nose down around the turn! If the nose rises, the machine will tend to balloon up at the end of the turn and come to a stop. Level the helicopter out with the aileron control. Try to keep the forward speed of the machine constant by using forward and back stick. Vary the throttle to keep the altitude constant.

Practice both right and left turns. Remember, right turns will be much easier than left turns. If at any time during the flight the engine sags, back off the power. The first flight is *not* the time to do your first autorotation! Continue to fly a pattern, such as a "figure eight," trying to maintain a constant forward speed and altitude. Keep track of the time so you won't run out of fuel.

When it's time to land, set up a pattern that will end up into the wind. Start to reduce altitude on the downwind leg and make a smooth turn onto final. Don't let the machine balloon up during the final turn and come to a stop. Try to maintain a good forward speed and a constant rate of descent. As the machine gets closer, start to feed in some back stick to slow it down. The power will have to be reduced simultaneously so the machine will not climb as you flare. The object is to have the machine come to a hover about 10 feet past you so it's in the position where you're most comfortable hovering. When the helicopter loses its forward speed and the flare is eased, it will need more power to maintain a hover so be prepared to add it. Once in a hover, land gently. When on final approach, never let the machine stop with its nose pointed toward you as it will become very difficult to control. If this happens, push the stick forward, increase the power and go around again. Never make a rapid vertical descent. A situation can develop where the machine will suddenly start to drop rapidly and adding power only speeds up the descent. If this happens, push the stick forward and fly out of it. This phenomenon occurs when a machine descends vertically faster than the column of air which supports it. The air then starts

(Continued on page 112)

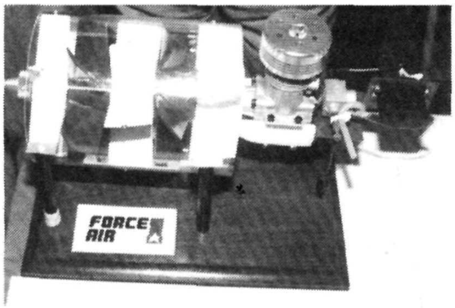


Jet Blast

by RICH URAVITCH

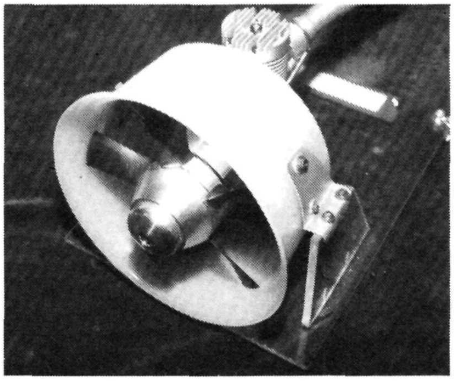
ROAMING AROUND the Toledo Sports Arena this year for the annual extravaganza, I tried to ferret out the things that might be of interest to you fan fans.

In the kit arena, I saw the Sterner Engineering* Sport Fan which we showed you in the August '87 issue. There's always lots of enthusiasts around Sterner's booth. A booth or two away, the Cressline* folks were showing their Northrop F-20 Tiger Shark and their brand-new Saab AJ-37 Viggen. Both are designed for 5-inch fans like the Dynamax or Turbax (III, I presume) and feature fiberglass fuselages and foam core for the wings. The F-20 is available right now, but the Viggen is still undergoing design refinements. The F-20 kit I examined looked good, and reports from other modelers who've purchased the kit seem to support my impression.

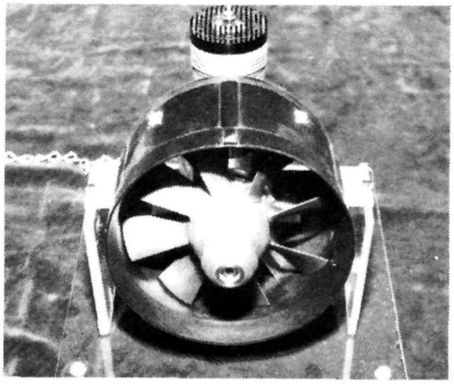


Force Air I tandem rotor fan claims 18-plus pounds on O.S. engine.

Next door to Cressline was Jet Model Products*, where Tom Cook was showing his Dynamax fan and Starfire. The fuselage of his new Starfire B was on display and appears completely different from the current version. The B employs huge round Harrier-style inlets, the stab has been relocated from the vertical fin to the fuselage and the hatch is now flanged, eliminating one of the biggest problems facing the builder. It fits great! Other design refinements include a clear canopy, and an easier-to-install inlet system.



Hurricane fan. No performance figures yet, but it is nicely built.



Hurricane manufacturers also make rotor assemblies tailored to applications. Turbax III shown.

I've seen it fly at the Canadian Fan Jet Rally (coverage in a future "Jet Blast") and it was impressive!

About 20 feet away, the Bob Parkinson Models* display included his Eagle, a sort of F-15ish-looking machine designed for the Byrojet. The video showed the Eagle to be a steady, solid flyer, which I confirmed first-hand at the Canadian gathering. This airplane should have lots of appeal for the newcomer as it is all wood with foam cores and some glass pieces thrown in for cosmetics. Also coming from Bob is a revised version of his CF-105 Arrow.

A stop at the Violett* ranch was next, the attention-getter being his new Viper, a lighter, swoopier, and reportedly faster member of his Sport Shark/Aggressor family. This is one exceptionally good-looking airplane! His F-86 Sabre was also on display, and the amount of design work that went into the inlet system was readily apparent. No "cheater" hole. No obstructions. Nothin' but air! It should be a winner.

At the Jet Hangar Hobbies* booth, owner Larry Wolfe was surrounded by outstanding airplanes, including the new single-engine F-4C in prototype form. The A-7 Corsair II still looks great and Larry should be ready to ship kits soon. The F-86 Sabre has been very well received and the two colorful examples on hand drew lots of interest.

Byron Originals* had their air force on hand, including the F-20 and the new Bullet, their answer for the emerging

Violett's new Viper, a lighter and faster member of the Sport Shark/Aggressor family. The airplane is obviously very good looking and has high performance.

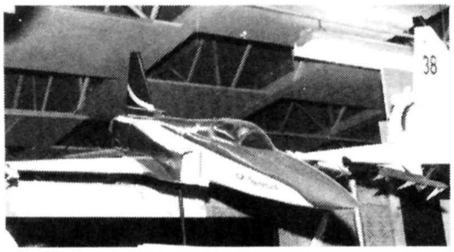
sport-fan market. This airplane is not in its final state, but I did see one fly at the Canadian rally and its performance was really great, excellent straight-and-level with good vertical performance. I'd guess it to be at least 20 mph faster than any of the other Byron jet offerings. It appears to use F-16 flying surfaces and a new fuselage that's got a lot of A-4 in it—including the chin protuberance that doesn't appear to serve any useful purpose. It's a homely fuselage at present,

Cressline's new SAAB Viggen glass fuselage, foam cores; for 5-inch fans.

which I hope will be cleaned up by production time. It's got the performance; now it just needs the cosmetics.

The answer to the Hun Hunter's prayer has materialized in the form of the North American F-100 Super Sabre available in "short kit" form from Century Models*. The price as I recall was $150, which is reasonable compared with other kits. The display model was finished in Thunderbird livery and was quite attractive. It was Byrojet-powered and features the now-common glass fuselage and foam cores.

Two new fans were available for inspection, the first from Force Air*, which uses



Cressline's Northrop F-20 Tigershark in Paris demo finish.

New Century Models release F-100 with Byro-Jet fan; semi-kit is available.

an O.S. .77 driving a tandem rotor. The display piece was a prototype and drew a lot of interest along with many questions that focused on the 18-pound-plus static thrust claimed. I don't know how it's done or measured but I'm really interested 'cause it represents the closest thing to dynamite that I've yet run across. We'll keep you posted. The Hurricane fan, available from Hurricane Fans*, appears to subscribe to the tractor school of design, positioning the engine behind the 5-bladed rotor. (No installed performance or flight figures were available.) This manufacturer also is making available tailored rotors to be used on existing fans. The thinking is, just as we select different propellers, you remember them, don't you?—matched to the engine, airframe and performance requirements, a single pitch, chord or density rotor may not be ideal for all applications. This approach accommodates the requirement. Interesting idea, as more data becomes available, I'll pass it along.

For peak performance, stay tuned.

**The following are the addresses of the companies mentioned in this article:*

Sterner Engineering, 661 Moorestown Dr., Battle, PA.

Cressline Model Products, 635 Third Ave. S., Park Falls, WI 54552.

Bob Violett Models, 1373 Citrus Rd., Winter Spring, FL 32708.

Byron Originals, Inc. P.O. Box 279, Ida Grove, IA 51445.

Force Air Technology, Inc., 9275 Trade Place, Suite G, San Diego, CA 92126.

Bob Parkinson Flying Models, 3 William St., Thornton, Ontario 2NO, Canada.

Jet Hangar Hobbies, 12554 Centralia Rd., Lakewood, CA 90715.

Century Models, 11B Senior Officer Row, Rantoul, IL 61866.

Hurricane Fans, Steve Korney, 14835 Halcourt Ave., Norwalk, CA 90650. ■

Tech Tips

Sporty Scale

by RICH URAVITCH

Dry Transfer Lettering

Kyosho Piper Seneca with name and N number added. Advantage is that no decal film carrier edges show.

HAVE YOU EVER noticed what seems to separate a *sport* scale model from a sport *scale* model? Up to a point they are equal, that is to the point of sport scale. From this point, the addition of little details as weathering and stenciling produces the sport scale, and generally much more competitive, model. By competition, I'm not necessarily referring to Scale Masters, FAI, or National level events; your own club "model-of-the-month" or static mall show is sufficient. Self-satisfaction is the only goal you need!

In recent issues, I've provided information on using paint over chrome MonoKote to create a realistic "weathered" look and sources of scale data. This we'll talk about using a graphic arts material to duplicate that neat lettering to give a crisp, finished look to your model.

The material I use for this job is available at art supply stores under the names of Prestype and Zipatone. I'm sure others are available also. It is generally called "dry transfer lettering" and is available in numerous sizes, styles, and colors for about $3 a sheet. When you select the style and color you want, you'll have to also select the size, at which point you'll discover that in the graphics business, size is expressed in "point size" rather than inches. To make things a bit easier for you, use the following conversion table:

Approx. size desired (inches)	Point size range
1/8	12-14
1/4	24-28
3/8	36
1/2	48-60
3/4	72-84

These are for "upper case" (capital)

Techniques

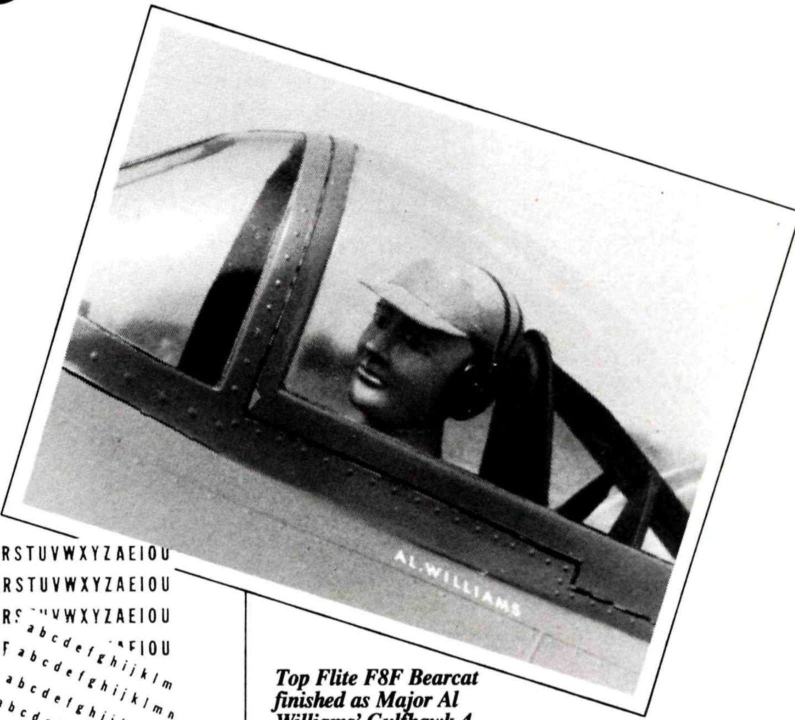
letters, and there is some variation with different type styles, but most dealers have catalogs showing the entire range.

Now that you know how and where to buy it, let's try using it!

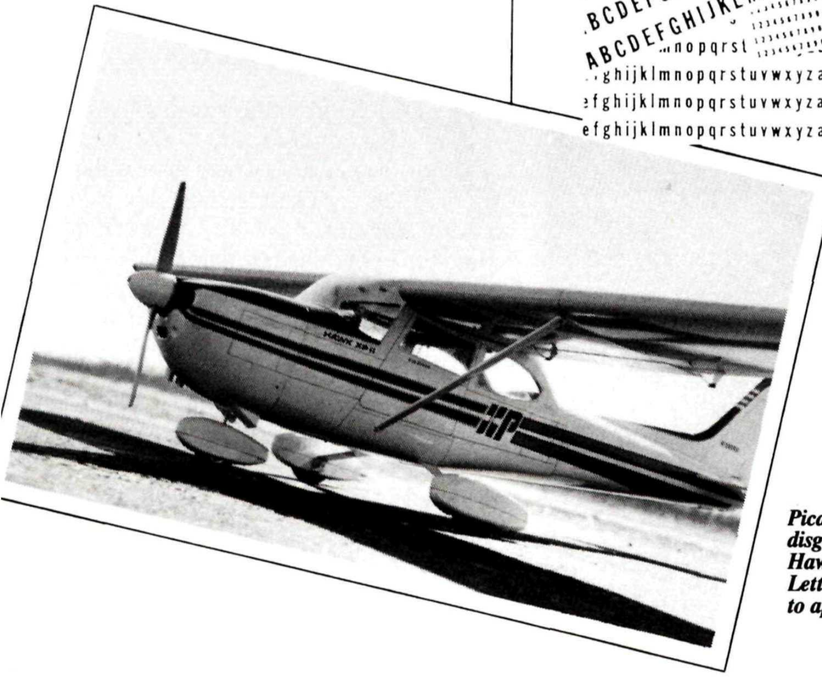
Each carrier sheet contains multiples of each character and will likely be enough for at least a couple of models. The sheet is backed by an additional separate waxed protective sheet to prevent the letters from transferring to a surface like your workbench when you lay it down!

The technique for application is simple and consists of positioning the sheet containing the character directly on the desired surface, and burnishing (I use a blunted pencil) the character enough to allow it to transfer. Removing the carrier sheet will cause the character to remain deposited where you placed it. Press directly on the character with your finger to insure it's stuck and move on to the next character, repeating the process.

Dry transfer lettering is available in hundreds of sizes and styles.



Top Flite F8F Bearcat finished as Major Al Williams' Gulfhawk 4.



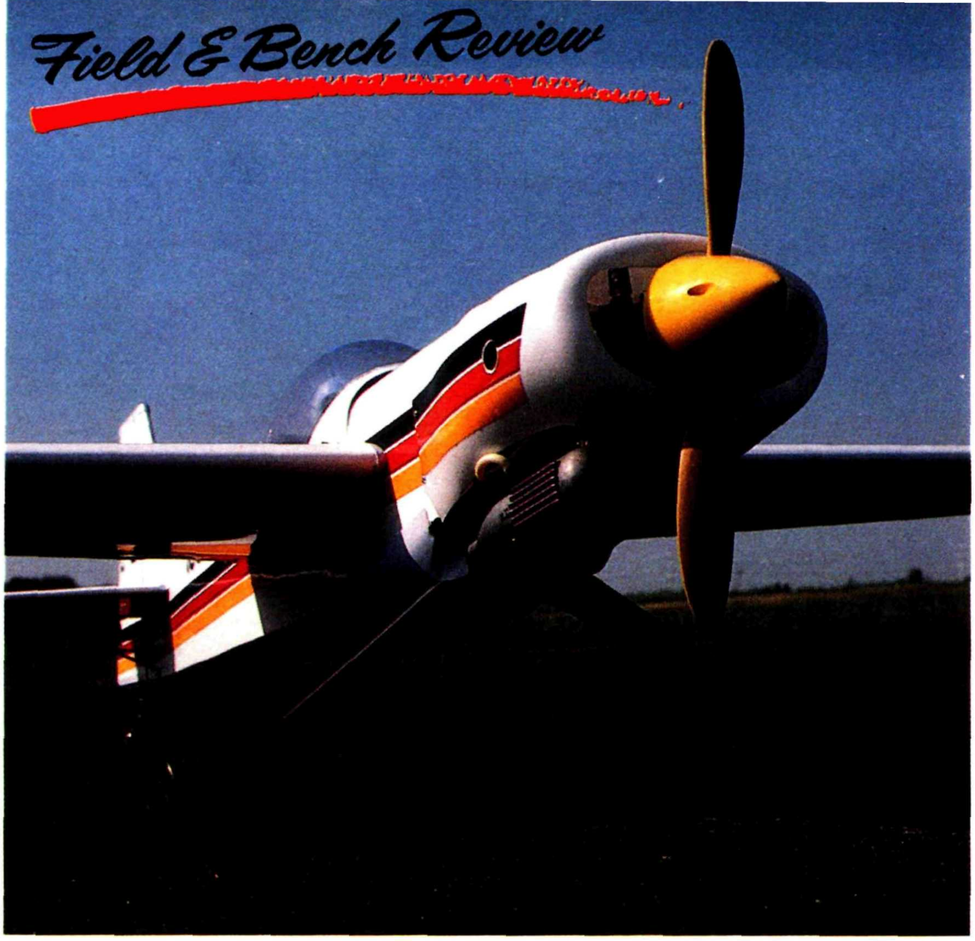
Pica Cessna disguised as XB Hawk model. Lettering is easy to apply.

Although each character is applied separately, it's not difficult and progresses rapidly.

The only variation comes with the type of surface you're lettering. The above procedures work best with fiberglass fuselages or other hard finishes. On film covered, or softer materials, the character should be "pre-burnished" on the waxed protective sheet to partially release it prior to placement on the actual surface. This will prevent "dents" in the wood from your burnishing tool. The beauty of this material is that if you goof, you can easily remove the character by scraping it off without damaging the basic finish.

After all the lettering is complete, it must be protected by a top coat of clear polyurethane or epoxy as it is not fuel-proof. This can be sprayed overall (on painted surface) or brushed individually on film covering.

You'll be absolutely amazed at the new dimension in realism this adds because of the crisp, uniform result it provides. ■



DIABOLO

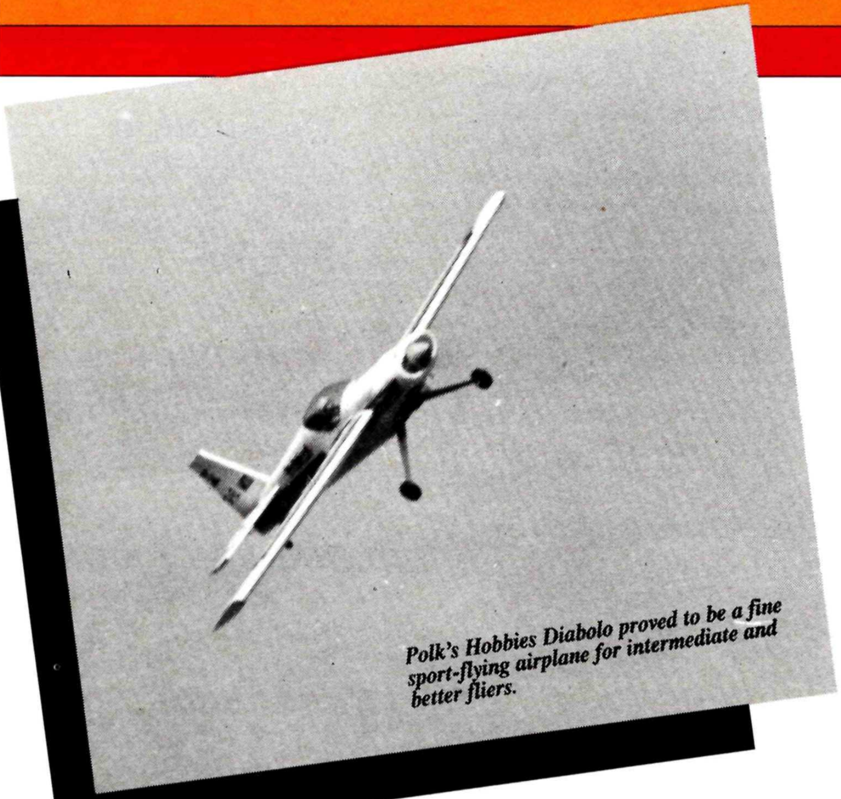
From Polk's Hobbies

Super-performing ARF at a bargain price.

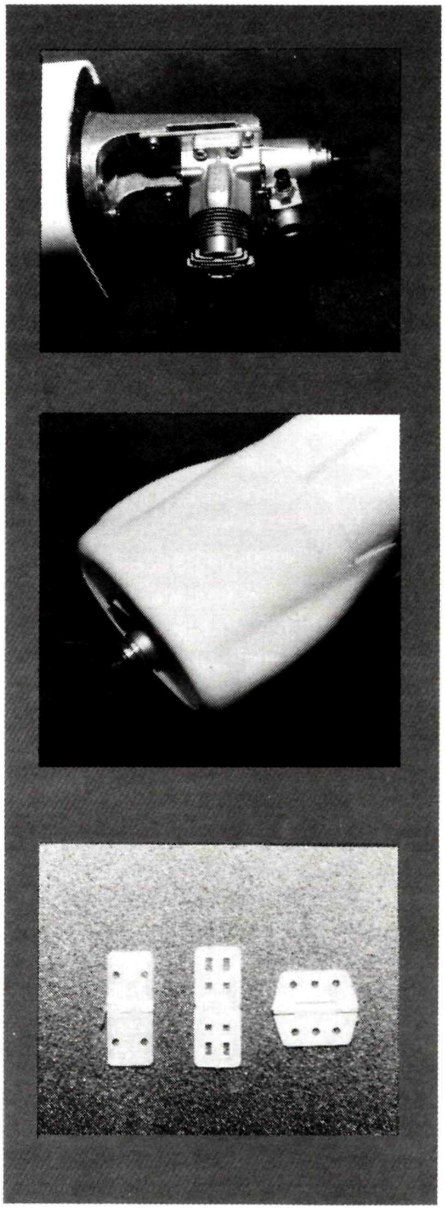
by RICH URAVITCH

JUDGING from the growing number of ARF (almost ready-to-fly) models now available, it would appear that we modelers are either getting lazy, have less building time available, are spending more time polishing our flying skills *while* building or a combination of all three. Whatever the reason, the ARFs are here to stay and my guess is that there will be lots more available in the future.

Gone are the days when the "ready-to-flys," or "plastic bags" as we used to call them, were marginal performers, overweight and under-engineered. Most of today's offerings are lightweight, usually great flyers, designed to assemble quickly and, of great importance, attractively



Polk's Hobbies Diabolo proved to be a fine sport-flying airplane for intermediate and better fliers.



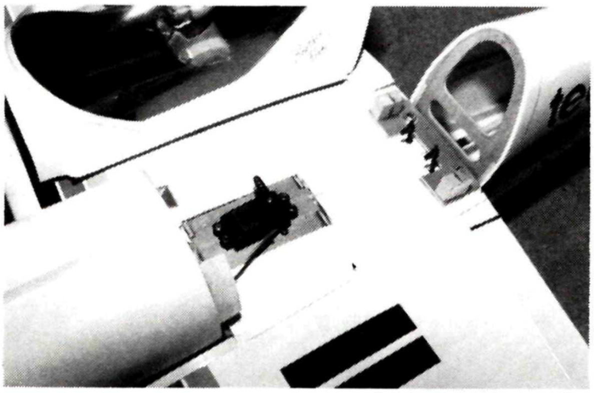
***Above:** O.S. 40FSR perched on factory-installed mount. **Middle:** Cowl is blow-molded and fits fuselage contour neatly. **Bottom:** Comparative hinge sizes, kit-supplied item on right. Note limited penetration capability.*

priced. A side advantage to all this is that scale-looking airplanes like the Pitts, Laser and, yes, even warbirds are available.

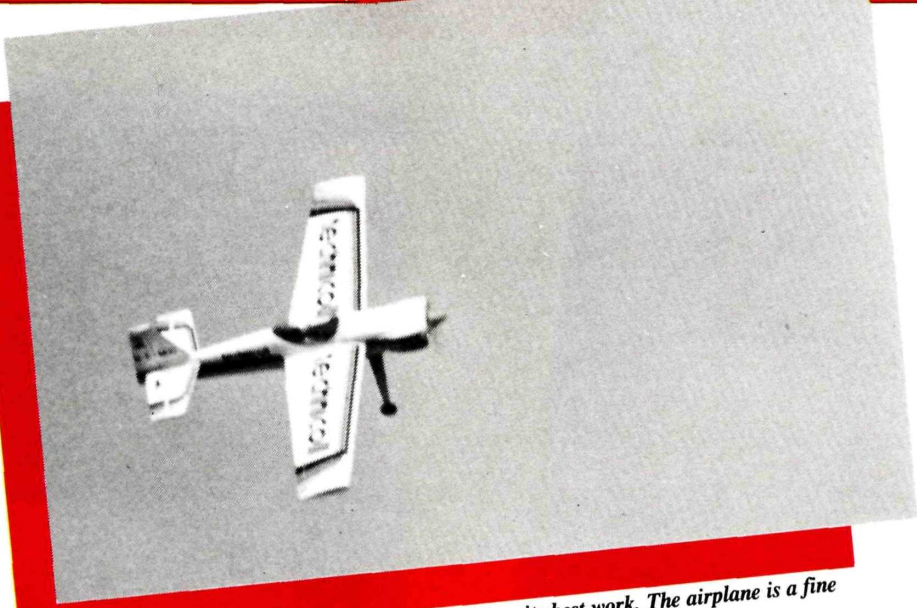
THE KIT. This Diabolo kit came from Polk's Model Craft Hobbies*, so it was a natural to couple the review with their Aristocraft Challenger 720 radio and present it as a package.

This is not the first ARF I've reviewed and it, like other ARFs, has some strong and a few weak points. It invites comparison to other similar RTFs on the market as nearly all of these new-generation flying machines are imported and share many of the same design and fabrication techniques which we'll discuss. This kit is produced in Taiwan and represents exceptional value when compared with the similar Japanese kits since the yen/dollar ratio is currently down from 240/$1 to 145/$1. So before you scream at the suppliers of your favorite Japanese kits, engines and accessories for raising their prices, think about how much more things are costing them to import!

The fuselage construction consists of a ply/balsa skeleton over which is bonded a pre-decorated 1/8-inch foam skin which has a clear protective coating. This technique provides an attractive finish, eliminates the need for sanding, filling, glassing and painting, is fuel-proof and easy to keep clean!



***Left:** Aileron and wing mount installation. **Right:** Note control surface hookup and stabilizer support strut.*



It is in the air that the Diabolo does its best work. The airplane is a fine performing addition to the ARF ranks.

Wingspan: *56 inches*
Area: *540 square inches*
Engine: *.40 to .45 2-cycle*
Engine: *.60 to .80 4-cycle*
Channels: *4*

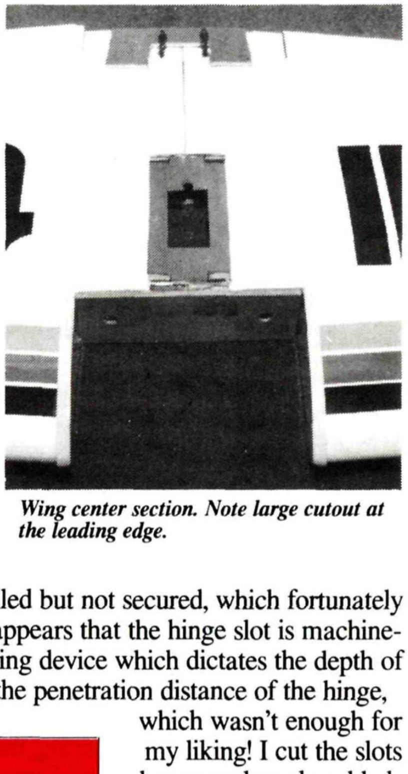
Whatever the reason, ARFs are here to stay.

The tail feathers are the same foam skins, again pre-decorated and fuel-proof, this time bonded to both sides of a balsa core.

The wing departs from other approaches by using a solid-foam core, instead of a built-up structure, to which our now-familiar pre-decorated foam skins are bonded. It is provided in two halves, joined by two 3mm-ply spars which run nearly one-third the span! I seriously doubt you could break this wing through even severely misguided control.

Assembly of my Diabolo took about 12 hours, using an illustrated 8-page assembly manual. There are some minor procedural glitches like telling you to drill the wing bolt mounting holes and attach the wing to the fuselage...but they haven't yet told you to install the wing mounting block in the fuselage. These are not big things and none of them will cause you to undo a previously done step to fix. You'll probably pick other things out by studying the booklet. The book is a bit sparse and leaves some things for the builder to figure out.

Two things I would strongly recommend you change or modify are the landing gear and all the control surface hinges. The kit-supplied aluminum gear is much too soft and will probably splay outward with each landing. You can either bend up a 1/8- or 5/32-inch music wire "follower" and use it in conjunction with the kit gear or, better yet, replace the gear with an after-market unit from Birdi, Hallco, Great Planes*, or the one I chose, Goldberg/Klett LG-15. This is a molded composite unit with stub axles already installed. It accepts paint and, on the Diabolo, retains the stock ground height while widening the track considerably. The other kit-supplied item I "deep-sixed" was the hinges.



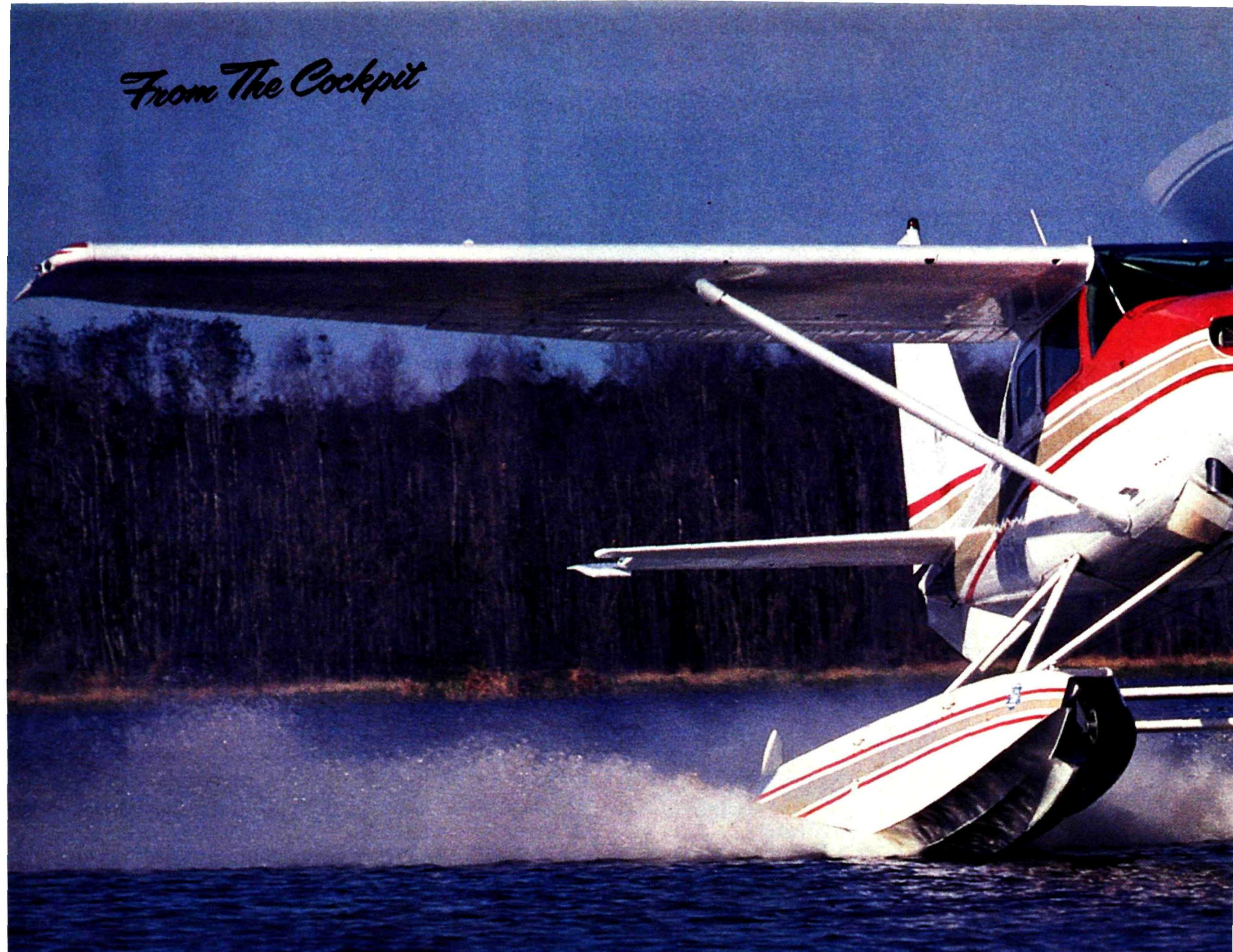
Wing center section. Note large cutout at the leading edge.

They're factory-installed but not secured, which fortunately simplifies removal. It appears that the hinge slot is machine-cut with a circular cutting device which dictates the depth of the cut. This determines the penetration distance of the hinge, which wasn't enough for my liking! I cut the slots deeper and used molded-nylon hinges which were 1/4 inch longer than the "stockers." These were epoxied and pinned and gave me lots more confidence in the control surface installation.

Polk's Challenger 720 was the project radio, with O.S. 40FSR power.

Everything else is well thought out, especially the motor mount system. Two plates are attached to your engine and the entire subassembly then is bolted to the pre-installed mount. This affords great flexibility of powerplant selection...2.8-liter V6 might even work! Being a

(Continued on page 113)



Super Floatplane Special

GET YOUR FEET WET!

by BUDD DAVISSON

THE SUBJECT is floats, or pontoons, or whatever those sometimes ungainly appearing things are called that allow aircraft and men to become water bugs whenever the demand arises. Floats is one of those subjects that seems to be overlooked when building models. This is curious when we consider that, as scale modelers, we're almost always looking for the unusual, the accurate, and the fun; and *that* definitely applies to putting airplanes on floats. Unfortunately there is a tendency for us to think of floats as always being cuddled up underneath a Super Cub or the trusty old Cessna 180 and we make no effort to go that route because the airplanes themselves don't turn us on. That's unfortunate because, besides the fact that flying floats is almost as much fun as you can have with an airplane, in reality the aforementioned Cub and C-180 are relative newcomers to the scene and only represent a tiny part of the float-borne population.

Maule Skyrocket M-6 with help the EDO floats gains access to the beautiful wilderness.

photos by RUSSELL MUNSON

Ford Trimotor on floats epitomizes the Golden Age, as does the Chrysler building in the background.

It's almost easier to mention airplanes that have not been on floats than those which have, and floats are at least as old as airplanes. The reason is quite simple: early airplanes required perfectly flat, unobstructed places to land, a requirement which has not changed much today.

Consolidated Fleetster, one of the first attempts at commercial airlining, made use of many landing sites with EDO 5300 floats.

However, we've managed to pave over a reasonable amount of the world's real estate to make runways so this requirement is more easily met now than it was in the early 1900s, when aviation was in its infancy. Although the Wrights took to the air off launch rails and eventually wheel/skid combinations, many of their competitors took to the water for takeoff and landing sites. The first Boeing was on floats. Glen Curtiss put his early machines on floats and even Langley's ill-fated Aerodrone, although it was launched from a houseboat, was meant to land in the water.

Airplane development in those days moved much, much faster than did airport development and, while many parts of the country could boast of endless cow pastures, other parts of the world would go for a generation or two before an airport was ever built to accept a growing fleet of aircraft. For that reason the '20s and '30s are jammed full of modeling subjects that could be put on floats.

Almost every biplane you can name, at one time or another, found itself sitting straddling a pair of floats and coasting down the Amazon or the Hudson, for that matter. WACOs, Travel Airs, you name the model and somewhere there are some documentation photos to support its life

Bellanca 77-140 on EDO floats taxiing on the Delaware River. Despite arms control prohibiting the sale of military hardware abroad, this was a convertible-type aircraft. Note "observation nest" in nose, machine-gun adaptable.

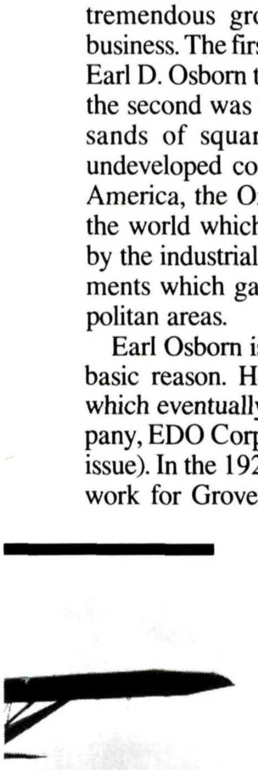
on the water. Two things occurred, however, which really gave impetus to tremendous growth in the floatplane business. The first was the introduction of Earl D. Osborn to the aviation world and the second was the opening up of thousands of square miles of previously undeveloped country in Canada, South America, the Orient, and other parts of the world which had been hopscotched by the industrial or agricultural developments which gave rise to major metropolitan areas.

Earl Osborn is important for one very basic reason. He formed the company which eventually became *the* float company, EDO Corporation (see story in this issue). In the 1920s, Earl Osborn went to work for Grover Loening to help build some of the big Loening flying boats. Although an aviation journalist of some note, Earl Osborn's primary involvement was in the design of the float/hull of the Loenings. In 1925 he left Loening to form his own company to build a competitive airplane. In short order, however, he diverted his attentions to building floats which could be attached to existing land-based airplanes rather than homing in on water-use-only flying boats.

Prior to EDO's entry into the field, floats had, without exception, always borrowed upon boat technology. They were wood, subject to rotting, and incredibly heavy. Earl Osborn knew there had to be a better way. He saw it in the then-new material aluminum. It was super-light, easily formed, and resistant to corrosion in a fresh water environment. It did, however, require the development of new skills and engineering technologies which were still quite new to the aviation

Piper Cherokee climbing onto the step. Note full flaps.

(Continued on page 126)



Lockheed Modified Explorer/Orion, circa 1935. Will Rogers and Wiley Post's plane on the day before the crash. Explorer wings with Orion fuselage.

EDO FLOATS

Sixty-two years of excellence.

by JOHN SULLIVAN

I THOUGHT the EDO Float Company consisted of a handful of guys who worked out of a big metal shed at the edge of a northern lake. Wrong. That *was* the case when Earl Dodge Osborn founded the EDO Aircraft Company in 1925, but today we're talking about a company which has grown from 14 employees to 1,400 and 6,000 square feet to 672,000 square feet, with customers in the U.S. and with 36 foreign companies.

Osborn had already served in WW I, designed and utilized a student trainer, and become owner and publisher of *Aviation* magazine before EDO undertook its first project: an all-metal 110-hp flying boat called the Malolo. When the market for lightly powered flying boats became limited, the company switched to the design and construction of all-metal floats for the conversion of land planes.

EDO's first aluminum floats were installed on a WACO 9 biplane in 1926. Less than a year later they were producing an improved float featuring revolutionary fluted bottoms, a vast improvement over the conventional wooden floats available. EDO captured the market and never looked back. By 1929 they were manufacturing 8 different float models for 25 different types of airplanes.

Seaplane floats were in great demand because of EDO's pioneering efforts, and Osborn's company began to take its place in history. Many unexplored areas of the world, including much of the Canadian and Alaskan northland, were first seen by pilots gazing past streamlined EDO floats. Captain Lewis A. Yancy made the first non-stop flight from New York to Bermuda in 8 hours flying an EDO-equipped Stinson Detroiter. Rear Admiral Richard E. Byrd and his pilot flew 800 miles over the Antartic seas to the stranded Little America in a Curtiss Condor equipped with giant 32-foot EDO floats. And the Ellsworth/Balchen team flew their Polar Star 2,800 miles over mostly uncharted seas and ice.

The '30s were the Golden Age of floatplane aviation. There's an appendix in EDO's Float Manual that can make a scale modeler drool—Aeronca, Arrow, Beech, Bellanca, Boeing—almost every airplane manufacturer is mentioned, with 47 WACO models *alone* listed.

Perhaps the greatest moment for EDO came when Colonel and Mrs. Charles Lindbergh used an EDO-equipped Lockheed Sirius on their 29,000-mile world flight over North America, Europe, Africa, South America, and the Caribbean. The Lindberghs began and ended their record flight at the EDO plant in College Point, New York.

In WW II EDO produced virtually every float used by the Navy and Air Force. Kingfisher floatplanes were launched from ship decks to protect convoys. One of the most dramatic rescues of the war was executed when Captain Eddie Rickenbacker and two companions were rescued by a Kingfisher after drifting in the Pacific for three weeks in a life raft. With one man squeezed into the cockpit and the other two lashed to the wings, the OS2U taxied them back to safety over 40 miles of sea.

The end of the war, the advent of the helicopter with its over-water capabilities, and the expected renewed interest in general aviation which never materialized forced EDO to take a look at its capabilities and diversify. Currently EDO manufactures everything from sonar equipment to mine sweepers to jet aircraft munitions ejectors to fire-hardened liners for rapid-transit cars. But EDO never forgot its beginnings and still makes the finest aluminum float available.

EDO currently manufactures two types of floats, the "straight" floats for waterborne service only and amphibious floats with step and castoring nose wheels for land and waterborne operation. The two types are produced in a variety of sizes to accommodate everything from a Cessna 150 to the twin-engined Piper Aztec Nomad.

EDO's brochures mirror the vicarious pleasures the float modeler enjoys. They talk about awesome panoramas a pilot might see while taxiing on the still waters of an otherwise inaccessible deep canyon lake, the spectacle of flying low along a sunset-lit coastline, and the quiet of an unspoiled north country wilderness—your moored plane in the campfire's glow being the only reference to a modern time frame. It's pretty heady stuff, but if you've ever seen a floatplane model turn on final against a shoreline backdrop of evergreens, set down on a lake as smooth as a mirror, and taxi back to the shore at your feet, you'll know they're talking to us.

For more information on EDO floats, there are two publications available: *How To Fly Floats* by Jay Frey, vice president of EDO's government systems float operation (and provider of information for this article) and *EDO Floats,* which is basically a catalog of currently available floats. Both publications are available for $3.00 per copy from EDO Corporation, Float Operation, 14-04 11th Street, College Point, NY 11356. ■

MULTIPLEX FIESTA SF from Hobby Lobby

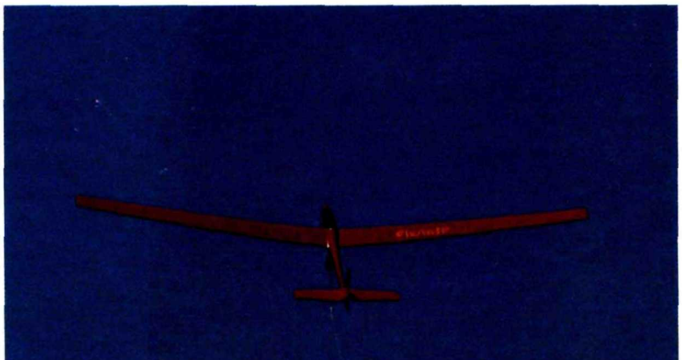
by JOHN LUPPERGER

THE MULTIPLEX FIESTA is imported from Germany and sold in the U.S. by Hobby Lobby*. It is a high-performance, multi-channel, thermal or slope glider utilizing rudder, aileron, elevator and optional spoilers for glide path control. Being a product of Germany, high levels of quality and engineering would be expected and the Fiesta SF delivers both. I was looking forward to this project for a couple of reasons. First, it has been quite a while since I've flown a multi-channel glider. This type of flying, which so closely emulates the flight of real sailplanes, is both challenging and extremely satisfying. Second, for the last couple of years I have been flying primarily 2-meter gliders and was looking forward to the higher performance levels of a bigger ship.

THE KIT. I was somewhat overwhelmed by the large size of the colorfully labeled box. The reason for this soon becomes apparent. Those beautiful pre-sheeted obechi wings and white gel-coated epoxy fuselage take up a lot of room within. The Fiesta SF is the most complete sailplane I have ever built. All pushrods, clevises, horns, hinges, bellcranks, and any other necessary hardware is included. The only other materials you'll need to purchase are adhesives, paint and your favorite covering material.

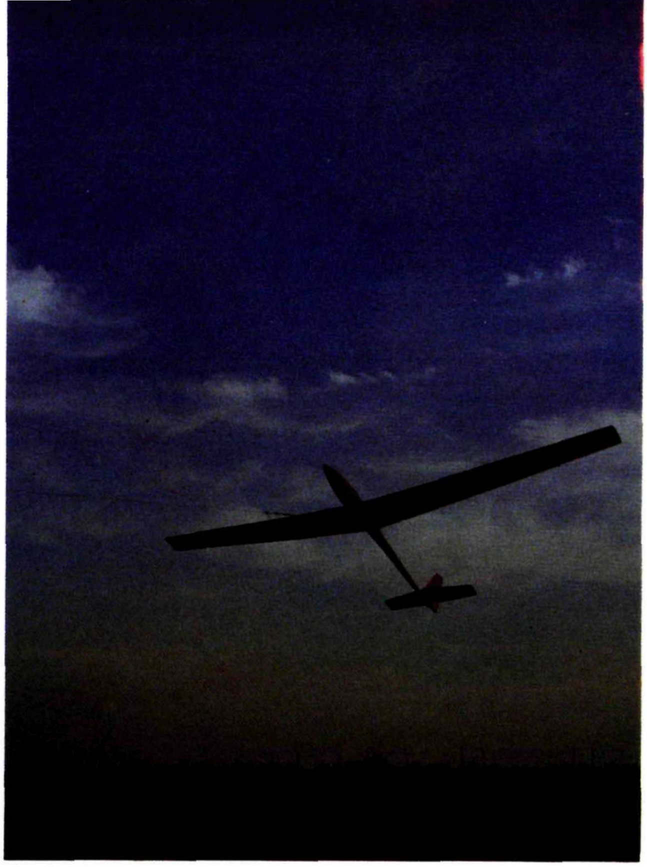
CONSTRUCTION. To make this review meaningful, I decided not to let any of my own preferences enter into the construction phase. So I followed the construction manual to the T. This is the only way you can really tell if the manufacturer has developed a product that will give each individual builder a model that will perform as advertised.

The basic wing construction is very simple and consists of freeing the partially pre-cut ailerons, facing them, gluing on the leading edges and tips, and sanding everything to shape. This is followed by the fitting of the aileron bellcranks and pushrods. A very large section of the construction manual is devoted to this area and should be followed closely. There is nothing tricky, but great care must be taken to assure smooth operation of the ailerons. If you decide on the optional Multiplex spoilers, which I



Wingspan: 127 inches
Area: 987 square inches
Length: 54 inches
Airfoil: Under-camber FX60-126

strongly recommend, they are installed next. Like the ailerons, a great deal of time should be applied to the installation of the spoilers to assure smooth operation. The extra effort employed in these steps will be well rewarded when it comes time to fly.



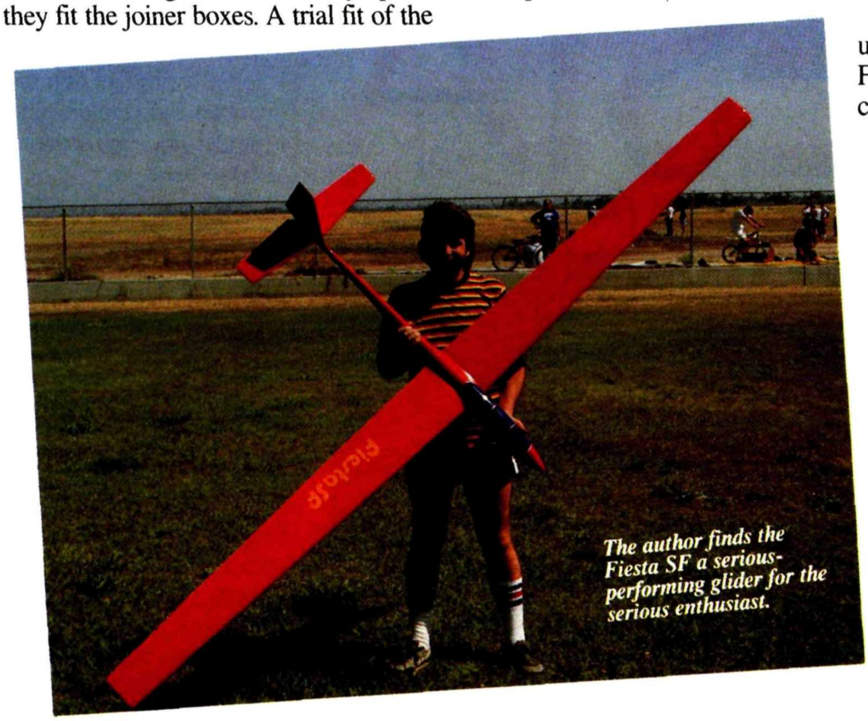
The full-flying stab and rudder are simple, built-up, fully sheeted structures that are very strong and light. The stab is a bit unusual in that it has lifting, flat-bottom airfoil. This is an important factor that affects the balancing and flying of the Fiesta SF, which I'll talk about later.

The fuselage requires the most amount of construction time, even though it is fiberglass. The first step is to mount the bellcrank for the full-flying stab. It mounts on two ingenious brass bearings that assure smooth operation and help with alignment. The rudder is then mounted with the supplied hinges.

Unlike most of our American gliders with plug-on wings, the Fiesta SF uses metal blades instead of wing wires to mount the wings to the fuselage. These blades slide into two separate joiner boxes. This is the point where I ran into the only problem with the construction of the Fiesta SF. The manual calls for the joiner boxes to be mounted where the scribed lines on the fuselage sides indicate. Upon making the cut-outs as marked, I found that they were undersize. Using a file, I carefully opened them up until they fit the joiner boxes. A trial fit of the wing showed these openings to be about 1/16 inch too high and too far forward. After opening the cut-outs to realign the wing, I was then faced with the problem of gluing the joiner boxes in holes that were too large and gave no support. With some careful aligning of the wings and taping over of the openings to prevent glue from getting where it shouldn't be, I finally got the joiner boxes glued in place. Hobby Lobby has been notified about this problem and is relaying it to Multiplex to see what can be done about it.

The plywood servo tray for the ailerons and spoilers is glued in the forward part of the fuselage leaving enough room for the battery in the nose. Final assembly step for the fuselage is to make the tray for the beautiful, heavy-gauge, blue-tinted canopy.

I used a Hobby Shack* Cirrus 900 FM radio with CS-130 servos for the ailerons and spoilers, and CS-128 servos for the rudder and elevator. There was plenty of room for installation, which is typical in size, which means that any radio you might want to use will fit with ease. An advantage of the 900 FM is its ability to electronically couple the ailerons and rudder to be able to adjust the amount of rudder-to-aileron mix. Due to the flat-bottom airfoil on the stab, the CG is located at about 50% of the chord, and a 500 mAh battery pack was all that was needed to achieve this balance point.



The author finds the Fiesta SF a serious-performing glider for the serious enthusiast.

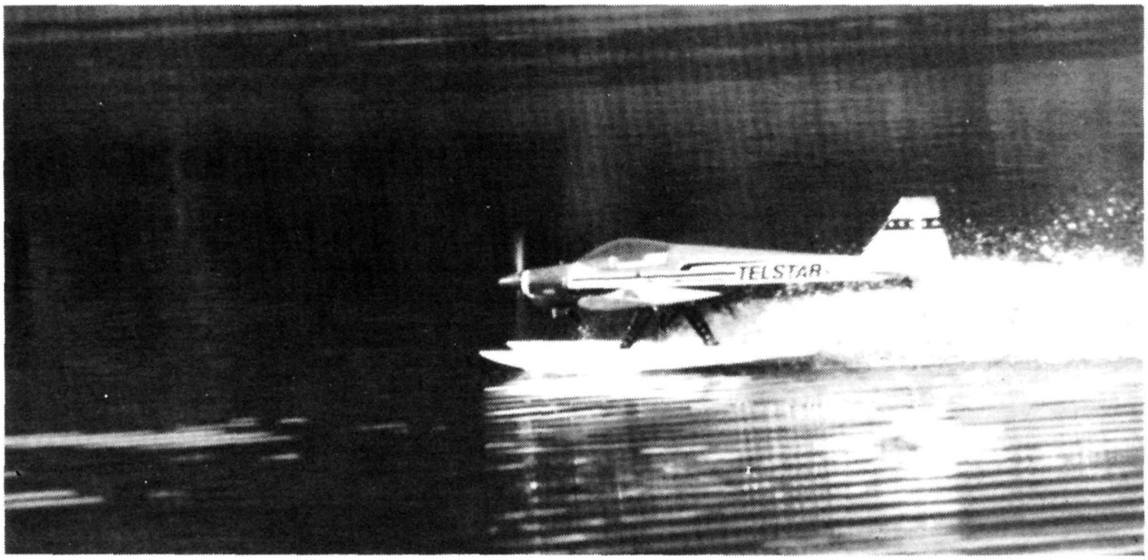
Although any covering material could be used on the obechi-sheeted wings, I chose Top Flite* Opaque Red MonoKote. The gel-coated fuselage needed only a light coat of Pactra* Prep Primer and one sanding to be ready for the final coat of paint. For the final coat I used Pactra Formula-U Missile Red. The canopy was trimmed with silver striping tape and the Fiesta SF transfers that were supplied in the kit were applied for the finishing touch. I like the all-red finish as I fly a lot of contests and find that it is easy for me to track this color at high altitudes. The ready-to-fly weight was exactly 4½ pounds, yielding a wing loading of 1½ ounces to the square foot.

FLYING. The initial hand-launch was quite exciting. That flat-bottom stab produces a lot of fit and I initially did not have enough trim. The first hand-launch ended rather quickly and

(Continued on page 112)

Floating Around

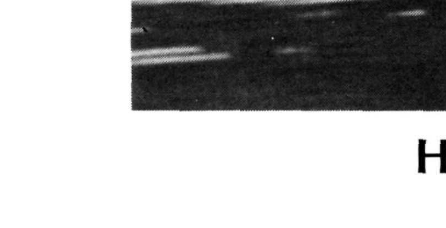
by JOHN SULLIVAN



How to cut your own floats.

FLOAT FLIERS today find themselves in much the same predicament as the quarter-scale modelers of just a few years ago regarding product availability. The major manufacturers currently are producing float kits and cores in two or three sizes only. The modeler who wants a set of floats ideally suited to his plane must either deal in generalities, build a plane to suit the floats, or scratch-build a set of his own.

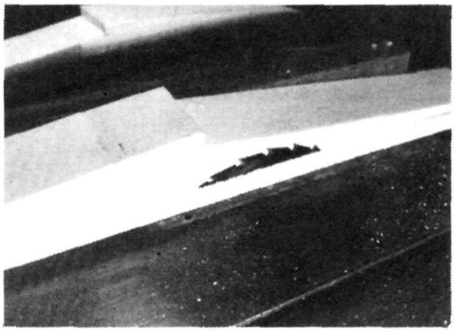
So I've decided to illustrate a method of construction which some of you may not have considered: a machine-cut foam float which is reinforced with redwood strongback and then directly covered with 6-ounce glass cloth and brushable 5-to-1 epoxy resin. A pair of floats constructed in this way are practically bulletproof, weigh the same as other types of construction, and can be built and mounted in a week of evening sessions.



Forward profile being cut on band saw. Note strongback epoxied in place.

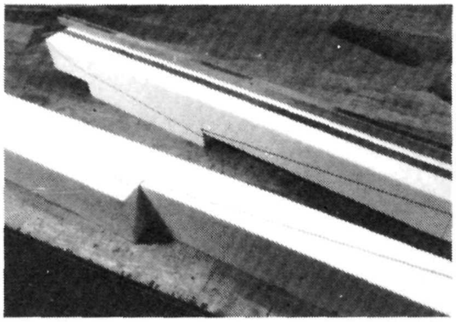
Foam is very inexpensive. I've made cores from blocks used to pack greenhouse windows. I was given about 30 cubic feet of it for hauling it away. You can also buy a 6-inch by 4-foot by 8-foot slab of it for $30 (poly-styrene 1 pound per cubic foot), and produce eight 48-inch float pairs for under $4 a set. There are other obvious attributes to foam. It's light (an uncovered 36-inch core weighs 2¼ ounces), waterproof, provides an interior free of voids, and can be repaired, if broken, with 5-minute epoxy.

The initial step involves calculating the size of the float you'll need using the dimensions from the "Basics of Float Flying," the companion article in this issue. Rough-out a block which is the correct width and a little longer and deeper than you need, then draw the side profile on the blanks. If you're going to imbed the strongback, you should cut a ¾-inch-square dado in the float deck at this point and epoxy the strongback in place.



First pass on table saw set at 17°. A perpendicular flat is left for a fence rest.

I dadoed the underside of the strongbacks on this set to bring the weight down to 3¼ ounces each, but you could also Hot-Stuff two 3/16-inch birch ply pads to the float tops after glassing to use for

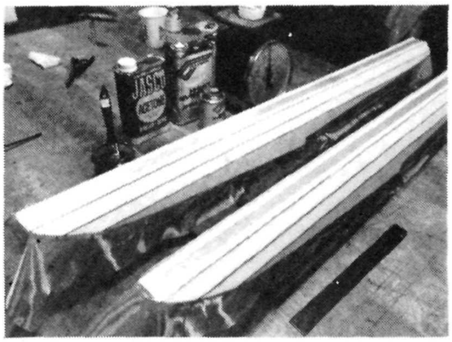


Floats marked for profile band-saw cut. Redwood strongback is dadoed for weight saving.

attachment points and save even more weight. The side profile is then cut in the core using a bandsaw. It's not safe to assume that everyone has a bandsaw and a table saw at their disposal. There are a few alternatives. Hot-wire cutting is one, but if it's something that you don't regularly do, the simplicity of the project is destroyed. Secondly, you could treat this as a club project, joining with members who *have* the equipment and cut several floats in one session.

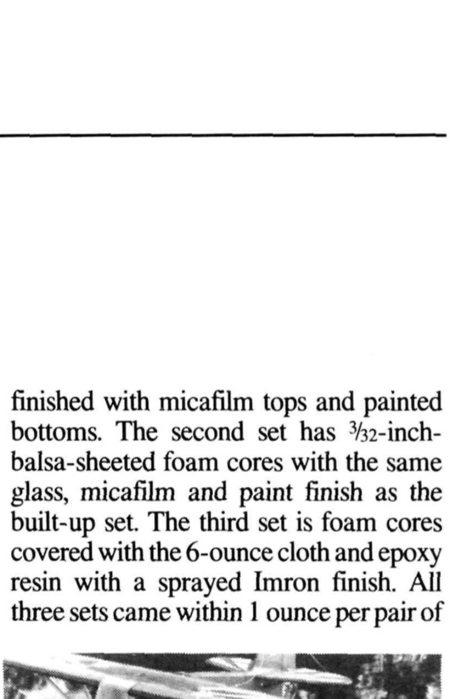
The third method is a bit primitive but works well. The foam is cut with the help of a friend using a loose hacksaw blade and a push-pull motion following guidelines on *both* sides of the cut. Leave 1/8 inch clear of the line with this method and sand down to the line with the carbide perma-grit sanding blades Stanley Tools makes for their Surform line. If you use a light touch, these blades will whisk away the foam very accurately without tearing. Use the 40-grit for shaping, the 80-grit for trimming, and the oldest worn-out 100-grit sanding block you have for final sanding.

The next, and final, series of cuts will give the floats a rounded appearance by producing 3 flats, or chines, on each side of the float. You may want to play around with this, but generally the first cut is made with the table saw blade set at 17°. You'll notice that a flat is left on the float side after the first cut. This is important because that flat will rest against the saw fence, providing stability on the remaining cuts. You'll also notice that, because of the upsweep of the float bottoms, the table saw cuts will leave a slight top profile taper in the fore and aft sections of the floats. This adds a lot to their appearance, but you have to be careful not to enter the rear upsweep any more than around 9 inches from the stern or you won't have enough of a vertical flat left to rest against the fence. After making the 17° pass on both sides of the floats, reset the blade to 45° and cut-in the final chine. It's best in all of this to cut light the first time and then move the fence closer to get the shape you desire. After machining, sand the floats smooth. It's best to radius the chines slightly to allow the glass cloth to lay flat without buckling at the chine high points.



Floats set on finish nails for glassing. Felt-tip-pen lines highlight chines for clarity.

Weight is an important consideration for floatplanes, and 6-ounce cloth with resin sounds like the heaviest skin you could come up with, but consider the following: I've recently completed three sets of 48-inch floats and compiled some interesting statistics. The first set was of built-up construction, glassed with 2-ounce cloth and polyester resin and finished with micafilm tops and painted bottoms. The second set has 3/32-inch-balsa-sheeted foam cores with the same glass, micafilm and paint finish as the built-up set. The third set is foam cores covered with the 6-ounce cloth and epoxy resin with a sprayed Imron finish. All three sets came within 1 ounce per pair of



Mike Johnson's stretch-wing E-Z Citabria on 34-inch floats with 36-inch set in foreground.

the others, with the built-ups at 2 pounds, 15½ ounces, the sheeted cores at 3 pounds, and the 6-ounce glassed cores at 3 pounds, ½ ounce. The conclusion is that any of the three methods will work, but when you consider the construction time involved, the glassed cores are a hands-down winner.

The key to success here is to utilize the relatively new 5-to-1 epoxy resins which have recently been introduced to the hobby market by PIC Adhesives*. This stuff is unlike any resin you've used before in that it brushes on with the consistency of a high quality varnish and sands beautifully. Some of the locals have resisted it because of their concern over getting the 5-to-1 ratio poured accurately, but it's easy if you use a scale and mix by weight rather than volume.

Glassing a set of floats is a simple process. To begin, drive four 3-inch finish nails into scrap lumber and push the foam

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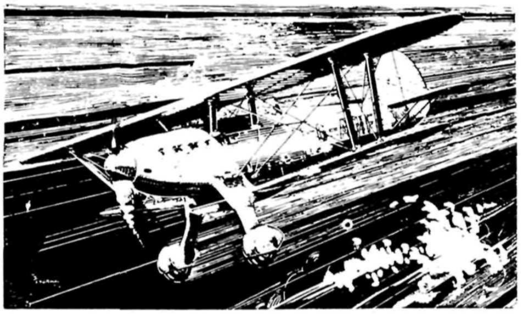


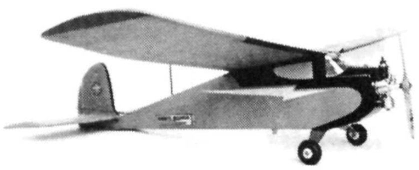
Golden Age of

by HAL "PAPPY" deBOLT

LET'S START with a letter from one of our OT R/Cers, William Mitch of Hebron, Indiana. Bill got started in R/C as a high-school student with a Live Wire Trainer. After that initiation, he moved on to a Cruiser. He says he had flawless operation, which was quite unusual in those days. The R/C system was a Mac II transmitter (noted for its more than normal power), a Citizen-Ship receiver, and a Bonner S-N escapement, a rudder-only setup. The Trainer flew with a Cub .09, then progressed to a Cub .14 with performance he describes as "wow!" With rudder-only Bill found out that too much power was a no-no. He powered the Cruiser with a rare K&B .23 which never gained the popularity of the widely used Ohlsson.

Bill goes on to say that after graduation his first job was with the Grish Brothers, manufacturing wooden Tornado props. Tony Grish's farm-factory was a modeler's utopia in the wide-open Indiana countryside, with complete shop facilities, control-line circles, and an R/C field, all used for propeller development. While the initial propeller evaluation was done on a static test bench, the props also went through thorough flight testing and comparisons. The result was that Tornado props were considered the very best. Bill says that his work never left him with a shortage of props!

Left to right: Jerry Nelson and Walt Schroder of Model Airplane News discuss the first FAI R/C World Championship, with the team of DeBolt, Kazmirski, and Dunham.



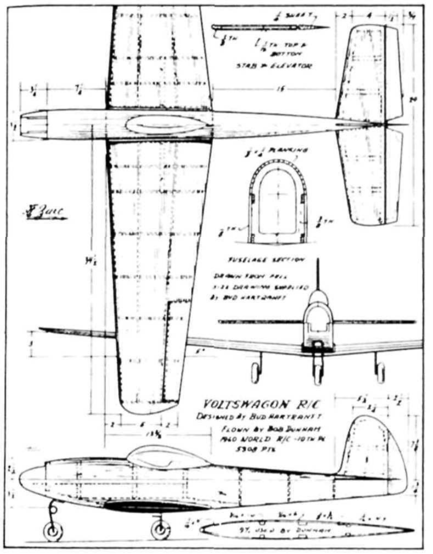
Live Wire Kitten was probably the first ½A R/C kit. Anderson .045, Control Research radio.

Bill has a long interest in small R/C planes and chided me about the "Golden Age" history. He feels I've left the impression that all early R/C designs were large. Actually the situation is not much different from today. Generally the impressive R/C aircraft were and still are the bigger sizes, yet we see modelers enjoying the simplicity and less effort involved in the R/C dwarfs. This appeal got its start in the early days.

I believe it was Howard McEntee who put together a cute little "looks-like" version of the Tipsy Nipper, powered with an early .049, just to prove that miniature R/C was possible. Howard's experience intrigued me so much that I had to try a small one, too. Although ½A engines were in their infancy, every modeler had to have several, along with models to use them with. My "answer" was a little cabin design which went into kit production as the Live Wire Kitten. With its 34-inch span, power was an Anderson .049, the radio was a Lorenz two-tube receiver, with a Bonner S/N escapement for an all-up weight of 24 ounces—16 ounces of radio and only 8 ounces of plane!

In those days every new creation was a flight into the unknown, so thirty-odd years later the first launches are still vivid memory. I remember the Kitten on its maiden flight, climbing out briskly from a hand launch, responding precisely to control, and with an empty tank landing neatly at my feet. Miniature R/C was for real.

Although handicapped by the short supply of early lightweight receivers, impressive numbers of the Live Wire



R/C

L.W. Custom Bipe was deBolt's FAI entry. Bramco 8-channel.

William Mitch's early .010-powered R/C. Rudder and engine control by Alvin Rx and Bentert actuator. Engine for size comparison.

Kitten were sold.

In reviewing R/C's history, I see four distinct eras, which could be labeled Pioneer, C-B Early Days, Reed Times, and Modern Day. All grew to an apex and were gradually replaced by the next phase, sometimes rather quickly. In retrospect, the reed era seems most important, for with these systems the basics of modern R/C were established. They even gave us a glimpse at what ultimate R/C could be. I've described what reed systems were and talked about the people who introduced them. The next step would be proportional systems, but with the importance of reeds it seems logical to set the stage for the final phase with an in-depth look at the modeling scene at the time propo was born. I should say that TTPW, Galloping Ghost, etc., were considered proportional and are perhaps the granddaddys of today's R/C, but let's find out a more direct link.

This was still a time of rapid advancement, radios were changing almost monthly and reed system abilities allowed new types of aircraft design. The majority of R/C fliers were filling the sky with cabin styles and the more adventurous were giving the "new-fangled" low-wings a try, amazing everyone with their maneuverability. Pylon racing was beginning and scale was starting to show more promise. It seemed there was excitement at every flying session.

The year was 1960 and the FAI finally recognized R/C with the first World R/C Championship. There have been many Champs since then, but the first was the most prestigious and exciting event R/C had seen. For the first time the world's finest R/Cers would gather in one place where the progress of the leading countries could be compared.

The first FAI World R/C Championship was for aerobatic flying only and the host was the Swiss Aero Club with Arnold Degan chairman. The site was the Dubendorf Airport near Zurich, Switzerland, and the date was July 24 and 25, 1960. The location was ideal, in a broad valley with a mild mid-summer climate and the only potential problem the 4,500-foot altitude. Twenty fliers and eight countries participated, the cream of the R/C world. The Swiss arrangements for the entrants were first class, including special customs considerations and a Swiss guide for the entire stay. Living quarters, meals, etc., were in a fine resort hotel in Dubendorf.

The AMA R/C aerobatic rules had been stagnant for several years. The FAI schedule was newer and completely different, including more complex maneuvers. The American team had to learn the FAI schedule. Unfortunately, after all the preparation and traveling thousands of miles to enter, the FAI allowed only two flights and *both* counted for the score. This would haunt the American team when the results were tabulated.

While the scheduled maneuvers were different, none of them were beyond the team's ability. The most spectacular and difficult was the "tail slide" where the model was supposed to stop nose-high and actually slide backward. Out of all the entrants there were very few who could complete the entire schedule—very much different from today!

With the FAI announcement there was great excitement in the American pattern fraternity. To choose a team an extensive elimination program was established. With only three members it was felt that the U.S. would be best represented if each member were from a different section of the country, east, midwest, and west. For the 1959 flying season several meets in each section were designated as required selection contests, with the final event to be the Nats held in Los Angeles that year. An R/Cer would earn team points for his placing in each meet, with a five-meet maximum. The system worked well, with such an extensive schedule that the chosen team had to be consistent and of high caliber. The west and midwest team members were quickly apparent. Bob Dunham was the reigning Nats champ,

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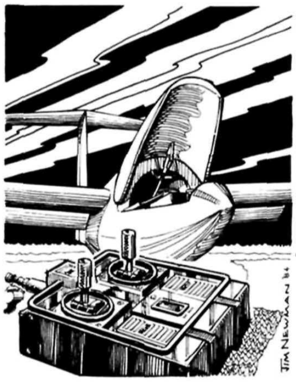


Soaring News

by JIM GRAY

A NUMBER OF READERS have written to ask about sources of airfoil information, particularly the latest Eppler and Wortmann profiles. Jim Newman* sent me some information from the EAA magazine *Sport Aviation** (March 1987), which gives some great insight and information into this matter. Jim, as you know, is a columnist for *Model Airplane News**.

"The F.X. Wortmann airfoil catalog is available from Stuttgarter Profilkatalog, Att: Dr. A. Weise, Institut Fur Aero and Gasdynamik, Universitat Stuttgart, Stuttgart, West Germany. The price, including postage, is DM 95.15 surface mail and DM 107.35 airmail. Be sure to check with an exchange bank before ordering.

"In addition to the Wortmann airfoils, which have been tested on sailplanes and at low Reynolds Numbers, the Eppler airfoils are also world known for the same purpose. Information can be obtained from Professor Richard Eppler, Leibniz Strasse, No. 84, 7000 Stuttgart No. 1, West Germany."

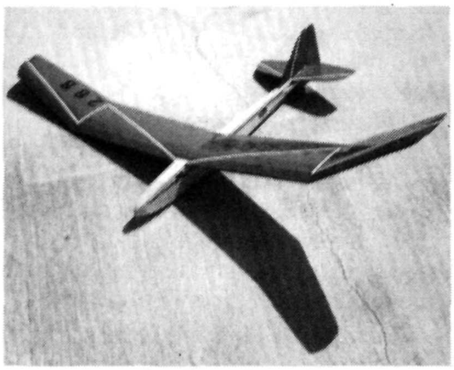
Since we've started with airfoils, let's continue with them for a bit. I've enclosed a set of full-size Wortmann FX60-100 profiles for you to use when building your next wing section. This particular airfoil is well known for its low drag, high lift and excellent performance on both the full-scale sailplanes as well as the models. For model use, Eppler profiles have been more popular, perhaps because better known among modelers, but the Wortmanns are extremely good and have been in wider use among full-size machines.

For your next project, try these Wortmanns and let me know how you like them. I wish to thank *Sailplane*, Journal of the National Soaring Society*, for these airfoil drawings. They appeared in the March-April 1987 issue. If you want a source of excellent information about who is doing what in R/C soaring, and to have your voice heard where it counts, then consider joining the NSS*.

For more information about R/C soaring consider purchasing *Soartech**. Issue #6 has just come out, and is chock-full of good information. Herk Stokely is the editor and has prepared a magnificent series.

Questions from the Soaring Mailbag

Recently, I received a letter from David Dang asking about what he could do to change his slope soarer into a thermal soarer. It seems that Dave is fairly new to soaring and bought an aileron slope soarer instead of the thermal sailplane he should have bought—and he wanted to know if this purchase was a total loss, or if there is something he can do to fly it on two channels as a thermal ship.



New Kastaway hand-launched glider from Bridi aircraft designs; 60-inch span.

I wrote Dave yesterday with some suggestions, and I'll paraphrase my answer here just in case someone else out there may have faced a similar problem. First of all, sailplanes designed for slope soaring are somewhat different from those designed for thermal soaring, however it is possible to slope-soar thermal machines or thermal slope machines, but results in either case may be less than satisfactory. A slope sailplane is designed to have a higher wing loading and produces the necessary lift at a higher speed. Wing loading is defined as the wing area of the plane divided by its total flying weight and is expressed in ounces (or pounds) per square foot. A slope machine will likely have a wing loading of 12 ounces or more per square foot, whereas a thermal sailplane of the Standard Class size will likely have a wing loading of 10 ounces per square foot or less.

The slope sailplane will have been designed to fly fast and "penetrate" into winds of perhaps 25 or 30 miles per hour...conditions that would ground the average thermal sailplane. Its rate of sink is of less consequence because it will be flying under conditions where sink rate is relatively unimportant due to the up-slope lift. On the other hand, a thermal sailplane will need a low sink rate and somewhat higher lift at the sacrifice of speed and penetration to better cope with thermal conditions where the lift can be light and thermals small in diameter, requiring tight, low-speed turns with a low sink rate to maximize performance under these conditions.

Now, how can Dave modify his straight-wing, aileron-equipped slope soarer to fly it in thermals with even a small chance of success? Well, the first thing is to build it as light as possible to reduce the wing loading. The second thing is to further decrease wing loading by *increasing* wing area. This can be done fairly easily by increasing the wingspan. Let's say that this slope plane has a span of about 80 inches or so with an average chord at the tip of about six inches. By adding ten inches to each tip, the span will be increased to 100 inches, and the area will increase by 120 square inches! It's possible that even a ten-inch added span will turn a sloper into a thermal sailplane, albeit one that won't be really competitive with an out-and-out thermal soarer. However, the money spent on the slope ship won't have been wasted entirely.

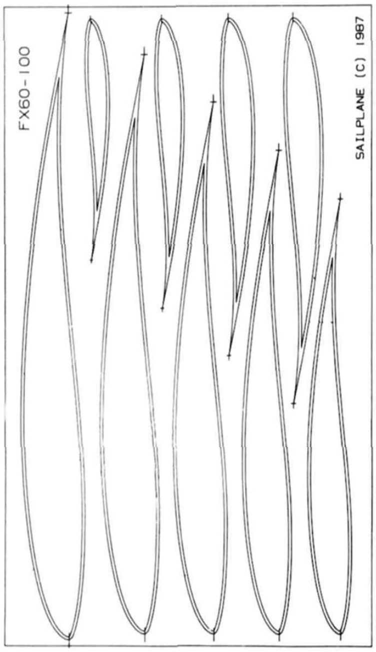
The next thing to consider is how to convert a basically three-channel glider into one that will fly on two channels using a simple and basic radio that does not have a third (or fourth) channel. The

simplest means is to couple the rudder to the aileron with a mechanical linkage, or to omit the aileron entirely and add a slight amount of dihedral to the wing. If you choose to couple the rudder to the aileron, the sketch included here can show you how to make it work.

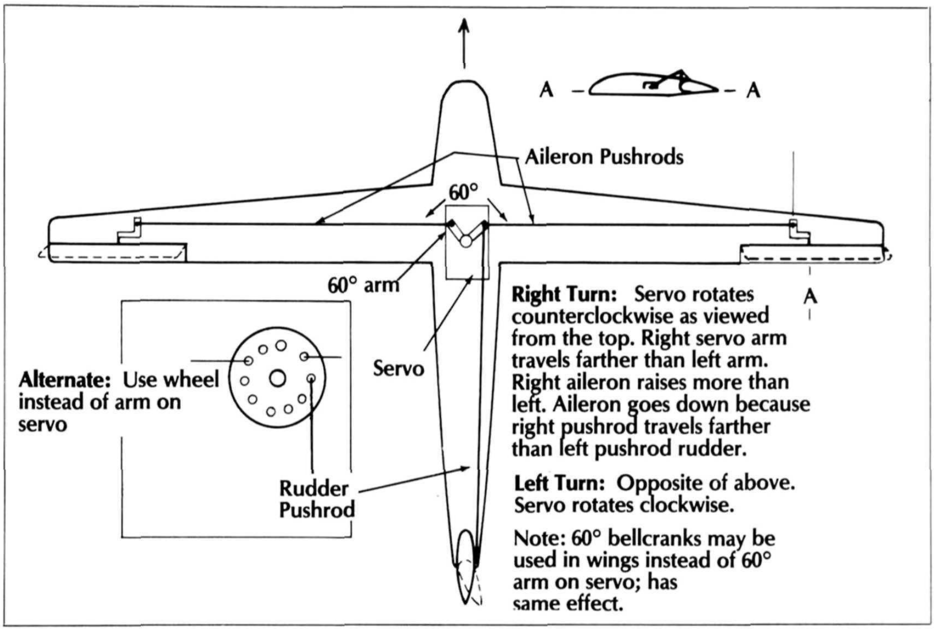
For those of you who have fancy radios with electronic "mixing" of control functions, the matter is very simple because coupling in the radio does the work for you.

Dave also wanted to know how and why an aileron must travel farther in the "up" direction than it does in the "down" direction, that is, why there should be differential movement.

The answer to this is called "adverse yaw." Let's assume you want to turn right with an aileron sailplane. Usually, there is very little dihedral in the wing. You feed in right stick to move the ailerons and bank the wing to the right. The right-hand aileron goes Up and the left-hand aileron goes Down. What's wrong with that? Well, look at what happens: the down-going left aileron tends to drag the left wing to the left, *opposite* the direction you want to turn. The up-going aileron on the right wing doesn't have the power to overcome this drag because it has reduced the lift on the right wing. The result is a slip to the right and a yaw to the left; very inefficient and ugly-looking. In order to get the nose to "follow the turn" and turn to the right, you have to apply right rudder to overcome the yaw in the wrong direction caused by that down-going aileron. What to do? Two things:



Wortmann FX60-100 foils. Double outlines for wing skins, singles for built-up.



reduce the amount of down-going aileron and increase the amount of the up-going aileron...making differential travel. Typically, differential will be two to one, or three to one, and the sketch shows how this can be done mechanically. By coupling the rudder into the controls, the rudder moves to the right (in the case of a right turn) helping overcome the slight amount of adverse yaw remaining, and resulting in a smooth, coordinated turn to the right.

In a sailplane without ailerons, dihedral is used to initiate the turn with the help of the rudder. The rudder yaws (skids) the nose to the right, for example, and the skidding motion makes the left wing go faster, creating more lift while the right wing goes slower, reducing the lift. This banks the wing to the right and a reasonably coordinated turn results. In this case, the rudder area and dihedral angle are critical if a smooth turn is to result.

Present-day fliers are more and more likely to use ailerons because of the added maneuverability and control provided, as compared to rudder-only sailplanes. It is generally considered by proficient pilots that aileron-rudder control is more efficient as well, giving that little bit of extra performance required to win.

Back to your problem, Dave. Another possible solution is to use the fuselage you bought and just build another and larger wing with more area, and perhaps some polyhedral (tip dihedral). If you do this, be careful t nake the dihedral sufficient to make good turns with the available rudder area. You may even have to increase the rudder area slightly. If this sounds like a lot of work, it is! Maybe the best overall solution would be to sell your slope machine to a slope soaring pilot and use the proceeds to buy a thermal machine but that would be admitting defeat, wouldn't it?

In any case, you ought to find an experienced glider pilot nearby and ask him or her to be your instructor. There is no way to do it by yourself without crashing and rebuilding repeatedly...so play it safe and get help.

A lot of this is elementary for those of you who have been around awhile, but for the rank beginner it is essential. I'll wager there are more beginners reading this than there are experienced pilots, so I feel it isn't wasted. Obviously, I can't teach a complete course in the basics within this column, there are numerous books on the subject, but as opportunity arises through letters and questions, I'll try to answer them in a way that can help everyone. Again, the answers won't be comprehensive, but enough to get you on the right track and keep you out of serious trouble.

Have fun, and let's meet again next month. Keep your letters and pictures coming (black and white only).

Jim Gray, c/o *Model Airplane News*, 632 Danbury Rd., Wilton, CT 06897.

**The following are the addresses mentioned in this article:*

Sport Aviation, Experimental Aircraft Association, Wittman Airfield, Oshkosh, WI 54903-3086.

Jim Newman "Hints & Kinks," c/o Model Airplane News.

Soartech, Herk Stokely, editor/publisher, 1504 Horseshoe Circle, Virginia Beach, VA 23451.

National Soaring Society, Secretary Cliff Oliver, 8151 Broadway, San Antonio, TX 78209 ■

OPER. 4-STROKES

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ary, seemingly none the worse for what appears to have been an attempt at self-destruction—or, possibly, the attempted destruction of its owner by hurling its prop assembly at him.

From various observations and investigations, this awesome phenomenon can result from one or more of a number of conditions.

First, it has been observed that such occurrences are usually preceded by audible detonation, i.e., a high-pitched "knock" or *"ping"* as it is descriptively known to U.S. auto mechanics. Detonation will occur if the engine's compression ratio is too high. The highest practicable compression ratio is determined by (among other things) the design of the combustion chamber, the fuel employed, the mixture strength and the ignition timing relative to the speed of the engine under load.

Early automobiles suffered a good deal from detonation. It was dealt with by providing the driver with a manual ignition timing lever, by which means the spark could be retarded when the engine began to labor and knock when climbing a hill, for example. Nowadays, so long as the right grade of gasoline is used, we rarely encounter detonation in our cars, partly because of improved engine design and better fuels, but mainly because ignition timing is automatically controlled, either mechanically or as part of a complete electronic management system. In the future, such systems will continually monitor all the conditions under which the car is operating, including atmospheric conditions and fuel quality and will control spark timing, air/fuel ratio and even inlet turbulence, accordingly.

Unfortunately, we have very little control over ignition timing with our glowplug-ignition model engines. It is quite remarkable, in fact, that glow ignition works as well as it does. However, there are things that can be done—or at least borne in mind—to reduce the risk of detonation and its consequences.

The most important of these is not to run the engine too lean. Detonation most frequently occurs when, after the engine has warmed up, the operator is tempted to try to extract the last hundred or so revs from the engine by closing the needle-valve a little more. Either of the following may then occur.

(a) Detonation may set in while you are actually adjusting the needle. If you hear it, open up the needle-valve again *immediately* and, if you are quick enough, the "ping" will disappear and the engine will keep going.

(b) Alternatively, detonation may occur as the engine is continuing to warm up a few moments after you think you have found the optimum needle setting and have turned your attention elsewhere. This time you may have little opportunity to act. You may not even hear the detonation but, if you do, and there is no time to get to the needle, snap the throttle shut.

Detonation rarely, if ever, happens when the engine is running at part throttle. It is also less likely when the engine is running at full throttle but reasonably lightly loaded; that is, running on a normal size propeller rather than on an oversized one.

Atmospheric conditions can also affect an engine's propensity to detonate. Engines which have tended to detonate all too readily in hot dry weather, have been found to be much more amenable under cooler, more humid conditions. Too much nitromethane in the fuel can also induce detonation and some users have found that too high an oil content can also increase the risk.

It should not be thought that every four-stroke engine is ready to frighten its owner by suddenly emitting a bang and throwing its prop off. This was something that was almost unknown with early mild-performing model four-strokes. It first became recognized as a four-stroke hazard when certain manufacturers began looking for more performance. There was a period, for example, when fitting decompression gaskets to certain Enya engines became recognized as "a good thing." In more recent years, the Enya factory has introduced new models that are more powerful, yet do not detonate.

Many other four-strokes have also been tested which show little or no inclination to detonate even under extreme provocation. If an engine simply cuts out cleanly when overleaned, even when running on the largest recommended prop size, it is unlikely to suffer detonation problems at other times.

The development of new combustion chamber shapes appears to have been of some benefit in reducing the incidence of detonation, while the adoption of more positive methods of securing propellers has not only reduced the risk of the prop actually parting company with the engine but also, by preventing the prop from being able to slip on the crankshaft, has enabled its kinetic energy to overcome the tendency for the engine to stop as a result of detonation.

It used to be thought that fixing a

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prop so firmly to the crankshaft that it could not slip in an emergency, would be likely to cause the crankshaft to break. In the early days of model (two-stroke) engines, there was some justification for such fears. The lightweight engines of those times often had quite flimsy crankshafts and it was not unknown for them to break in normal use. In contrast, modern engines, both two-stroke and four-stroke, are much more sturdily built and the risk of shaft breakage through having the prop positively keyed to the shaft, is negligible.

There is every reason, therefore, to fix the propeller as solidly as possible to the shaft. Repeating earlier remarks in this chapter, there are basically two ways in which this can be achieved. Both require that the prop itself should have a generously dimensioned boss. If pegs or through-bolts are used, the prop boss must have sufficient material for it not to be weakened by the extra holes required and the prop nut must be kept tight and backed up by a locknut.

If, on the other hand, reliance is to be placed on the friction between the prop driver face and the prop boss, this is feasible only if contact is commensurate with the torque that has to be transmitted. As has been demonstrated, prop drivers are generally adequate in the case of small engines, but very marginal in the case of some large single cylinder engines.

Effect of Two or More Cylinders

Dividing a four-stroke engine's total displacement between two or more cylinders is, as previously shown, desirable in the interests of improved balance and a reduction in torque fluctuations. But these conditions not only make for smoother running qualities. The torque impulses, much less violent and occurring at closer intervals, are markedly less likely to cause the prop to slip. Detonation, if it occurs, will also be less violent in its effects.

Spark Ignition

Before leaving the subject of (a) detonation and (b) slipping props and the implications thereof, it needs to be mentioned that there is one way in which these problems can be eliminated in the case of (a) and reduced or overcome (b). This is by abandoning glowplug ignition in favor of variable-advance spark ignition. This gives precise control of ignition timing and thereby enables any tendency towards detonation to be forestalled by delaying the point at which the firing of the charge is initiated. Since detonation is also one of the causes of prop slippage, it follows that this may also be lessened.

Spark ignition was the only type of ignition used by model engines prior to World War II. It became outmoded by post-war European compression-ignition and American glow-ignition engines only because of its weight, relative complexity and the fact that it was the cause of 90 percent of the starting problems experienced by users in those days.

The spark ignition situation is now rather different, especially with modern electronic systems. These dispense with the long familiar mechanical contact-breaker or timer-points assembly and utilize, instead,

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optical or magnetic trigger systems which function without the need of frequent cleaning, adjustment or replacement. A good electronic ignition system can be relied upon to go on functioning, without attention, almost indefinitely, providing an intense spark at the plug over an extremely wide speed range. Weight is not a problem since spark ignition would not normally be contemplated for small engines. These systems normally run from a 500 mAh 5-volt rechargeable nickel-cadmium power pack, instead of the dry cells used in the early days.

Very few model four-cycle engines are produced at the present time with ready-installed spark-ignition systems, but conversion kits, manufactured by C.H. Electronics Inc., of Riverton, Wyoming, are obtainable to enable existing engines to be converted to this form of ignition. In Europe, the West German Graupner company is offering spark-ignition systems for O.S. four-stroke engines including the twin cylinder Gemini and four-cylinder Pegasus models.

A feature of all but a few of the very earliest of commercially produced model engines of the Thirties and Forties, was manually adjustable spark timing. This enabled the spark to be retarded for safe and easy starting and then advanced, when the engine was running, to suit its operating speed under load and thereby produce the best performance.

Curiously, not all modern electronic systems for model engines have such provision. It would appear that the adoption, in the early Seventies, of small industrial type two-stroke magneto-equipped gasoline motors (i.e., ex-chainsaw, weed-eater, leaf-blower, etc.) for large scale model aircraft, was influential here. Such engines seldom had manual ignition control. As originally introduced in 1982, the C.H. system also had fixed spark timing, but it subsequently became available with the addition of variable timing linked to the engine's throttle control. Known as TCTA (Throttle-Coupled-Timing-Advance) this rotates the plate carrying the magnetic (Hall Effect) pickup, automatically retarding the ignition for starting and advancing it again as the throttle is opened for full power. (The magnet that triggers the system is mounted in an aluminum disc, normally located between the prop driver and prop, or forming the spinner backplate.)

A different system of automatically advancing and retarding the spark is used on the Kavan electronic ignition system that is an optional extra for the Kavan FK-50 twin-cylinder four-cycle engine. Here, two Hall Effect pickups are installed, one located to advance the ignition through 15 degrees. A microswitch, mounted on the carburetor, switches the ignition timing from the advanced pickup to the retarded one as the throttle is closed to the idling position for starting. There is also provision for manually altering the timing so that the advanced setting can be adjusted to achieve the optimum spark advance according to the prop size and operating rpm. This is achieved by rotating the housing containing the two pickups so that they are triggered earlier, or later, by the magnets embedded in the camshaft timing gear.

Spark ignition has two disadvantages. First a good system adds considerably to the cost of the engine—too much so, perhaps, for it ever to become universally adopted for the smallest and least expensive types of four-stroke motors. Second, it is easier to "oil-up" a spark plug than a glow-plug if the engine is overprimed when starting. The latter is not a serious problem and the user will soon learn how to deal with it and, later, to avoid it. As regards cost, this is much the same for large engines as for small ones (but more for twin or multi cylinder motors) and for large engines the extra expense seems to be more than adequately outweighed by spark-ignition's advantages.

Peter Chinn, c/o *Model Airplane News*, 632 Danbury Rd., Wilton, CT 06897.

For more information on four-strokes, check out Peter Chinn's Model Four-Stroke Engines, *which covers the history, design, development, and operation of these popular engines. The book is available from* Model Airplane News *for $13.95 plus $1.50 postage and handling. See the* M.A.N. *book ad in this issue for ordering information.* ■

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diameter), as are the inlet and exhaust ports (8.5 mm).

CAMSHAFTS AND TIMING GEARS. Like all previous Enya four-strokes, the VT-240 has two spur-gear driven camshafts at the rear, the main difference being that each shaft has two cams, instead of one. Also, the camshafts, divided by the timing shaft, are mounted one above the other (the inlet camshaft at the top) instead of side-by-side.

The camshaft drive system is the same as for the single-cylinder Enya four-stroke. The timing shaft, which is machined in one piece with the crankpin drive take-off at the front and the timing pinion at the rear, is mounted in two ball bearings. These consist of a 12x19 mm 9-ball steel-caged front bearing, housed in the wall dividing the crank chamber from the timing case, and a 7x15 mm 9-ball steel-caged bearing inserted into the center of the backplate. The dividing wall and backplate also support the front and rear ends of the camshafts which, again follow standard Enya practice by running in bronze bushes.

The camshafts, nominally identical, have 5 mm journals and an 18.8 mm diameter 36-tooth spur gear. Cam profiles are of a round flank type and have an average lift of just 2.2 mm.

VALVES AND ROCKER ASSEMBLIES. The valves and valve springs are the same as those used in the Enya 90-4C and standard 120-4C. (This is in contrast to the R120-4C which uses differently sized inlet and exhaust valves.) The valves have 11 diameter heads and 3.0 mm diameter stems and, like all previous Enya four-strokes, employ "full-size" type tapered split cotters to secure the springs to the valve stems.

The hardened steel valve rocker arms are mounted on a hardened steel rocker shaft that is secured, with a single screw, to a short central post cast into the rocker box base. The rockers are some 30 mm long and the rocker ratio is 1.5:1 so that the valve lifts are increased, after allowing for valve clearances, to an average of approximately 3.2 mm or 0.32 x valve throat diameter. Neat pressure-cast rocker-box covers are fitted to the cylinder-heads.

VALVE TIMING. The manufacturer's quoted valve timing for the VT-240 is: inlet opens 30 degrees BTDC, inlet closes 70 degrees ABDC; exhaust opens 70 degrees BBDC, exhaust closes 30 degrees ATDC. This indicates opening periods of 280 degrees for both inlet and exhaust and an overlap (i.e., the period when, at the top of the stroke, both valves are open) of 60 degrees.

These figures are, of course, nominal. The tiny cams of even a relatively large displacement model engine have only to vary one-thousandth of an inch in lift to make an appreciable difference to valve timing. Likewise, variation in valve clearances will also extend or reduce valve opening periods quite considerably. In the case of the VT-240, the inlet cams give slightly longer valve periods than the exhaust cams: more so when valve clearances were reduced to the practical minimum. The working minimum clearance is always dependent on how accurately cams and cam followers are finished and, in the case of the VT-240, accuracy was such that it was possible to extend the measured inlet period by up to 40 degrees. The quoted valve timing, plus or minus a few degrees, was achieved with the valve clearances set at 0.06 mm. This is at the lower end of the maker's recommended range of adjustment which is 0.05-0.10 mm.

CAM FOLLOWERS AND PUSHRODS. The hardened steel bucket type cam followers are 6.4 mm diameter and operate directly in the crankcase material. As the exhaust camshaft is located 27 mm below the inlet camshaft, the exhaust pushrods are, of necessity, much longer than the inlet ones. Both are enclosed in chromium-plated tubular covers which are positioned, in the usual way, by flanges and O-rings, between the timing case and undersides of the rocker boxes.

CARBURETORS. Each of the VT-240's two cylinders is supplied by its own carburetor. Although this slightly complicates control adjustment procedures, it has the theoretical advantage of enabling the precise mixture requirements of each cylinder to be met and, by eliminating the need for a manifold, provides a more direct gas flow from carburetor to cylinder head.

The carbs are mounted side-by-side on a plated steel bracket at the rear of the engine and are assembled as a "handed" pair so that the needle-valves are conveniently located on

either side of the engine, while the throttle arms are coupled together in the center for direct connection to the servo linkage.

The carburetors are of the Enya G-Type with fixed automatic fuel metering controlling the mid-range mixture strength and an airbleed control for fine-tuning the low-speed mixture. Each carburetor has a machined aluminum body with a ground steel throttle barrel. The latter is bored 7.5 mm which, after allowing for the jet tube, gives an effective choke area of approximately 37 sq.mm. This is uncommonly large for a 20cc four-stroke cylinder and contributes to the characteristics revealed by the performance tests.

A neat banjo union type fuel inlet is fitted to each carburetor and a special Y-branch fuel tube assembly is supplied to facilitate connection to a single delivery line from the tank.

INLET AND EXHAUST PIPES. The inlet pipes, of copper tubing, chromium plated, are 8.5 mm i.d. x 9.5 mm o.d. and are inserted into the carburetors with O-ring seals. The exhaust pipes are 9 mm i.d. x 10 mm o.d. and have a black finish. Both sets of pipes are flange fitted to the cylinder heads with aluminum gaskets and 3 mm hexagon socket head cap screws.

PROP DRIVE ASSEMBLY. The prop driver is machined from aluminum alloy, has a nominal diameter of 42 mm and is mounted on the 12 mm diameter portion of the crankshaft with a steel split taper collet. The collet is keyed against rotation by means of a Woodruff key and two 4 mm threaded drive pins are screwed into the prop drive face.

At the front end, the shaft is reduced to 3/8 in. diameter and has a standard 3/8-24 UNF thread for the prop retaining nut. The assembly includes a steel retaining washer, two conical spring washers and a hexagonal retaining nut. Also provided is a solid aluminum spinner nut which is recessed to accommodate the prop nut.

ENGINE MOUNT. A cast aluminum radial mount, painted black, is supplied for attaching the engine to the firewall. Four 5 mm socket head cap screws are used to fix the mount to the crankcase lugs previously described.

PERFORMANCE. The VT-240 is supplied with Enya No. 3 glowplugs. A pair of leads with strong push-on spring connectors is included to enable the plugs to be conveniently wired, along with a ground lead, to a central point for the external booster battery. The latter should have sufficient capacity to cope with the current drain of both glowplugs simultaneously.

The factory's recommended fuel for the VT-240 is one containing 15-20 percent castor-oil or, quote, "high-quality synthetic oil." (If in doubt about the latter, we suggest including at least 5 percent castor-oil.) A nitromethane content of between zero and ten percent is specified, the balance (70-85 percent) being, of course, methanol. After breaking-in the VT-240 on a straight 80/20 blend of methanol and castor-oil, we found that the engine was quite happy on 5 percent nitromethane and this was, therefore, used, along with 15 percent castor-oil and 80 percent methanol, for test purposes.

No choke control is fitted to the VT-240. If one uses an electric starter, as advised in the manufacturer's instruction sheet, choking the intake is unnecessary. The preliminary procedure is to open the two needle-valves ex-

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actly three turns each and to open the throttle to just above the idle setting, after which the engine is run on the starter until fuel is seen to reach the carburetors. The glowplugs are then energized and the starter reapplied. Then, according to the maker's instruction leaflet, "the engine will start." And it does.

Incidentally, the leaflet specifies "a powerful electric starter." This does not mean that you need a special heavy-duty 24-volt starter. The test motor responded readily to our standard Sullivan 12-volt starter. The trick is to remember that the firing intervals on this 80-degree V-twin are, alternately, 280 degrees and 440 degrees apart. Therefore, if the prop is slowly hand-turned (glowplug battery disconnected) through the two more closely spaced compression strokes (i.e., to just over TDC after the 280-degree interval) the starter will get a good "run" at the next compression (plugs energized) of nearly $1\frac{1}{4}$ turns. Also helpful is the grip provided by the large solid aluminum spinner nut.

Once the engine is running, the advised procedure is to open the throttle fully and to then turn each needle-valve clockwise, alternately, in small steps, until the optimum high-speed running settings are reached. Both needles can be closed down initially to about two turns open, in $\frac{1}{4}$-turn steps but, thereafter, they should be turned only a few degrees at a time. A point will eventually be reached where there is no further increase in rpm, or a slight falling off of power will be detected as one of the needle-valves is closed too far. At this point, the needle-valve in question should be immediately reopened slightly to restore steady running. The same experiment should then be applied to the opposite needle-valve. As with all engines, the rule is to have the fuel/air mixture strength very slightly to the rich side of that at which maximum rpm are achieved.

We found that adjusting the two needle-valves to achieve a balanced response was not at all critical. The actual running settings vary up to half a turn according to load (i.e., prop size), ranging from $1\frac{3}{4}$ to 2 turns open with the engine loaded down to its lowest full-throttle operating speed, to around $1\frac{1}{4}$ turns open at the peak of the bhp curve.

As previously noted, the Enya G-Type carburetors fitted to the VT-240 have a built-in fuel metering system which automatically takes care of fuel mixture strength at part-throttle settings, while an adjustable airbleed is provided on each carb for fine-tuning the idling mixture. We found the latter a little trickier to adjust. Minimum safe idling speeds were in the region of 2,000 rpm on the larger sized props. Adding a glowplug re-heat system would probably be worthwhile for extra reliability at minimum idling speeds and the manufacturer does, in fact, recommend such a system if the engine is to be installed in the inverted position.

A good deal of raw fuel was sprayed back from the carburetors when the engine was loaded for low and medium speeds. Apparently a consequence of the engine's short but very large bore carburetor intakes, this is the price that has to be paid for the

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VT-240's exceptionally good top end performance which, in fact, turned out to be quite a bit better than the manufacturer's claims.

The maker's instruction sheet rates the VT-240 at 3.2 horsepower at 10,500 rpm but, as the performance curves show, we obtained a peak output of better than 3.5 bhp at just over 11,000 rpm on test. In terms of *specific* output, this is the highest reached to date in the *M.A.N.* tests for a twin or multi-cylinder four-cycle engine.

In order to reach its peak power in level flight, the VT-240 might need to use, for example, an 18 inch diameter fine (6 inch) pitch prop, or, for a smaller, faster model, a 16 inch coarse pitch prop. However, the top of the power curve is fairly flat, so that having the engine propped for ground rpm of 8,500-9,500 (remember, it will pick up about 10 percent in level flight) will still release high levels of power. The engine still produces useful power when propped for around 8,000 rpm in flight, i.e., not much more than 7,000 rpm static measurement.

Typical prop rpm recorded on test included: 7,100 on an 18x12 Airflow beech, 7,300 on a 20x10 Kavan glass-fiber epoxy, 7,450 on an 18x10 Zinger maple, 8,100 on an 18x8 Top Flite maple, 8,700 on an 18x8 Zinger maple, 8,950 on an 18x6 Zinger maple, 10,050 on an 18x6 Top Flite maple and 10,300 on a 17x6 Airflow beech.

The factory quotes a "critical speed" of 11,500 rpm—meaning that this is the maximum speed at which the VT-240 should be allowed to run. There is, of course, no reason to run the engine faster than this as such a speed is actually above the rpm at which maximum bhp is reached. We checked the VT-240 at this speed—and a little higher—and we have to say that it ran seemingly effortlessly and with commendable steadiness.

No problems with detonation were experienced at any time. Nor did we have any trouble with props loosening. Full-throttle fuel consumption was somewhat heavier than the 60cc/min quoted in the instruction leaflet. A tank size of 700-800cc (25-28 fluid oz) is recommended for normal use.

As previously noted, the Enya VT-240 is relatively light for a 40cc four-stroke twin and this, combined with very good top-end power, makes for a much better than average power/

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weight ratio. The manufacturer suggests aircraft weights of 6-10 kg (13-22 lb) and the VT-240 should give these a quite lively performance.

Peter Chinn, c/o *Model Airplane News,* 632 Danbury Rd., Wilton, CT 06897. ■

R/C NEWS

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building sequence more efficient.

If your time or inclination brings you to trying an ARF, much of the above still applies. The main point is, check the kit. Manufacturing variations do occur and if you don't want to live with a bubble in covering or a twisted control surface, reject the kit. Some dealers won't allow the inspection I suggest—if not, go to another hobby shop! You do have the right to be satisfied *before* you put down your hard-earned money!

By the same token, when you want to inspect a kit, don't do it on your own. Take it to the counter and inspect it in the presence of the dealer. Some kits are sealed by tape or heat-shrink covering which you must ask the dealer to open. I never buy anything without looking at it first. I suggest you do the same.

A dealer that wants to serve his customers will allow the kind of inspection I suggest, even though going through a kit is akin to digging a post hole; that which you take out does not necessarily go back into the same space. For that service, you should plan to buy the accessories, radio, engine or whatever from the dealer that met you halfway. Frankly, I've never seen a dealer who was willing to really help his customers who did not succeed.

In any event, a kit will surely be your entry point into R/C, so pick the one you want, build it well, finish it nicely and—enjoy.

I've done many, many product reviews on model airplane kits along with cars and boats over the years. Virtually all those kits have proven to be excellent offerings. And all generate a few nasty letters from readers who disagree with my assessment of the product.

A Field & Bench review results from a typical process. First, I am assigned a given kit, as are our other writers, and I proceed to build that kit as I feel most modelers would. I follow the sequence as presented and make no changes unless something appears totally wrong. Rarely do I replace any parts. If wood takes on a minor warp, I pull it into place. I keep notes on what I have done and that, eventually, becomes the report. In 99% of the projects I do, the kit brings a finished airplane equal to the claims of its manufacturer, often exceeding those claims.

That satisfactory rating is not, as some readers imply, an inability of this magazine or writer to point out imperfections in a kit because of advertiser pressure. Rather, I believe the 99% level represents a maturity in the business end of R/C that is, in recent years, producing very high quality products!

I will confess that my lengthy experience may tend to overlook minor kit problems in that I automatically correct some small problems without thinking such may be worthy of comment. A case in point: recently, in working on a well-known, built-up pattern airplane, a couple of ribs I found to be slightly undersize. The correction was simple, one I felt any experienced modeler (at least one capable of flying this bird) would make. Perhaps comments should be made on these points.

There are variations in kits; usually minor, but variations, nevertheless. It is only possible to comment on the kit I used. Not the one you used. Kits, even ARFs, do not come from cookie cutters. Wood varies in density and grain and it can warp. Die-cutting is usually very consistent, but even here, the material stamped can vary. Many kits, particularly ARFs, involve hand work (usually in jigs) which can introduce some variations. Fiberglass fuselages can be skewed a hair when two halves are joined—such a skewing can introduce an error into tail surface slots and even wing mount set-

tings.

Successful manufacturers have quality control. But there are tolerances that are acceptable with all. We don't build aircraft from precision steel parts. If you can hold a tolerance of 1/32-inch in wood and other modeling materials, you're doing very well. And the kits I see hold these tolerances; or at least that has been true over the past ten years. What it boils down to is, can a finished airplane be built with little in changes to duplicate the original? Those I've seen meet that need.

Some years ago, I did see some real "slugs" on the market. When I found one of them in my work schedule, I always informed the manufacturers of problems I saw. In all cases the kits were revised or never released. Remember, I have often worked from prototype kits before they have ever been released. When a product is really bad and no changes are accepted, that product doesn't make our Field & Bench reports.

Model Airplane News is not the "Consumer Reports" of model aviation. Our Field & Bench articles tell you what is in a kit, the quality of preparation, quality of instructions, things we feel may help in your building and, most importantly, how well the bird flew to meet its intended purpose. That is what they are! The day may come when scientific, precise evaluations can be done. For the moment, they are reports from one modeler to another.

Awhile back, I did a Field & Bnech on Texson's Tooter. This was a kitting of a *Model Airplane News*-published design in the September 1985 issue available as plan #9851. Clearly, I was impressed with the Tooter's potential as a trainer. Now, after many, many more flights—some by pilots with no experience—I am convinced that this is one of the best trainers ever produced.

Controls on Tooter are positive yet very soft with no over-sensitivity. But its stability is its top feature for a beginner. Tooter will recover from virtually any attitude given some altitude and a release of controls. This stability coupled with a fairly sedate speed makes Tooter nearly ideal for entering R/C flying. It gives a beginner time to think and make corrections; Tooter will recover given a reasonable chance.

It's easy to build; and even though it seems a bit fragile, it can take some pretty difficult shocks when one does make a mistake. Truly, light crashes better than heavy!

If you are a beginner, or if you have taken on the responsibility for training newcomers, look at Tooter as a trainer for everyone. The kit, or *Model Airplane News'* plans will get you into business quickly.

I found Tooter a lot more versatile with .15 power over its designated .10 power. The increase doesn't make it too fast and it gives an extra margin when power will help.

By the time you read this, the 1987 Lincoln, Nebraska, AMA Nationals will be history. This "grand old girl" of model aviation competitions has been through 61 editions. I'm sure the Nats' luster remains; it is the largest model airplane contest in the world with the most entrants and events. May she reign forever!

But there are two other events that are drawing many more spectators and that bring the favorable publicity that R/C so sorely needs. The first is in Ida Grove, Iowa, and is Byron Originals', Aviation Expo '87. This affair is a combination of the world-famed Fan Fly and Fun Fly run on separate dates for several years. Now we get five days of the best in ducted fans and giant scale. *(Continued on page 110)*

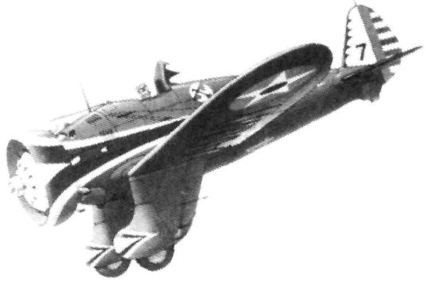
Product News

HAWKER HURRICANE

Imagine a Hurricane with a 62-inch wingspan and a low weight of 6½ to 8½ pounds, depending on flap and retract setup. The kit includes full-scale detail, including 5-views flap and retract setup. Spars are reinforced with carbon fiber strips. All parts are hand-cut from hand-selected balsa and bass wood and the cowl is one-piece fiberglass. The Aerodrome Hawker Hurricane MK IIc is designed for the Sunday flier, but with a little war bird experience under your belt it can be spectacular or relaxing. The Hawker Hurricane is just the first in a line of birds from Aerodrome Models (2623 S. Miller Rd., Saginaw, MI 48603).

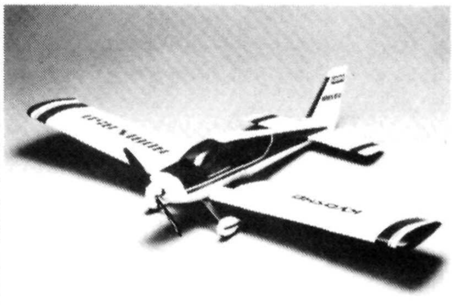
ELECTRIC FUEL PUMP

Aristocraft's new fuel pump is powered by either penlight batteries or the 6- or 12-volt jack of a power panel. The fuel pump uses a reliable Mabuchi motor and an efficient brass vane system for pumping. A large switch is used for either fill or drain and the alligator clips to the power panel are provided. (Intended for glow fuels only.) From Polk's Model Craft Hobbies (346 Bergen Ave., Jersey City, NJ 07304).



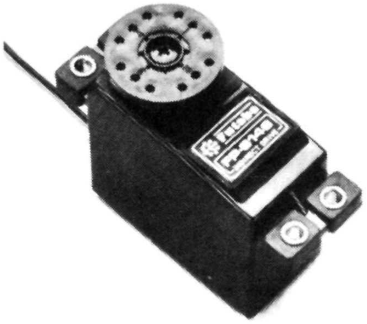
P-26A PEASHOOTER

The Peashooter is part of the Giant Scale Series from Royal Products (790 W. Tennessee Ave., Denver, CO 80223-2875). It is constructed of balsa and plywood and comes with a dummy radial engine and spun-aluminum cowl. The specs: wingspan 68 inches, area 850 square inches, length 57½ inches, scale ratio ⅕, engine size .60 to .90 2-cycle or .90 to 1.20 4-cycle.



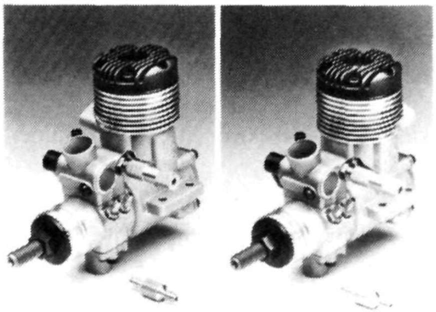
KYOSHO ROBIN

The new Kyosho Robin (33-inch wingspan) could mark the beginning of a new era in radio-control electric flight. The Robin comes with pre-covered balsa wings and a blow-molded fuselage. The Mini LeMans motor and matching propeller that come with the kit enable the Robin to perform many different aerobatic maneuvers. It also has a 6-volt mAh battery pack and charger already included in the kit. The Robin uses a special circuit that allows the radio to run off the motor battery, yet still gives the radio power even when the motor shuts off. From Great Planes Model Distributors (P.O. Box 4021, Champaign, IL 61920).



PRECISION SERVO

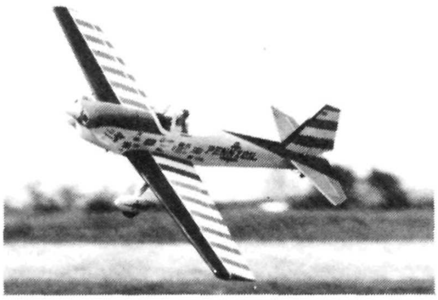
The new FP-S148 (S48) servo now included as standard equipment in many Futaba systems is a refinement of the popular S128. Computerized circuit board assembly, with direct motor, amplifier and potentiometer mounting improves reliability. Resistance to shock and vibration is increased. Torque and speed for the new S148 is also comparable to coreless servos, and height and weight have been significantly reduced. Specs: 1.59x.77x.40 inches, 42 inch/ounces torque, 1.5 ounces. From Futaba Corp. of America (555 West Victoria Street, Compton, CA 90220).



YS/FUTABA 45Fs

The YS/Futaba 45 model aircraft engine is a hand-built .45 version of the championship-winning YS/Futaba 60. Designed for maximum power output, the YS/Futaba 45 features superior material and advanced CNC matching quality, ABC design and YS/Futaba's unique, variable-pressurization system. This 2,000- to 18,000-rpm engine is available in both side (F.S) and rear (F.R) exhaust configurations from Futaba Corp. of America (555 West Victoria St., Compton, CA 90220).

Descriptions of new products appearing in these pages were derived from press releases by the manufacturers and/or their advertising agencies. The information given here does not constitute endorsement by **Model Airplane News,** or guarantee of performance by **Model Airplane News.** When writing to the manufacturer about any product described here, be sure to mention that you read about it in **Model Airplane News.**



SUPER CHIPMONK

The Super Chipmonk comes complete with a full hardware package, fully illustrated instruction manual, full-size plans (2 pages), and a large four-color self-adhesive decal sheet. There are more molded parts in this kit than in any other Goldberg kit to date—wheel pants, cowl, canopy, belly pan, even a full cockpit interior detail, all of which are made of a special resin that looks like ABS but has more durability. A plane that's noticed at the field, the Chipmonk is built on the workbench, allowing a flawless construction. Specs: 62-inch wingspan, 688-square-inch wingspan, .45 to .61 2-cycle or .61 to .90 4-cycle powerplants useable.

SILICONE COMPOUNDS

Two special silicone compounds have been developed by Loctite for modeling use. The Clear Silicone Sealer is ideal for bonding as well as sealing. You'll find that this formula dries faster and remains watertight. It also features excellent adhesion to fiberglass and hardwoods. The Hi-Temp RTV Silicone Gasket Maker is ideal for sealing mufflers to exhaust ports on any engine. You also make any size or shape gasket in seconds. This formula is resistant to hot fuels and oils. Loctite products are available through the Sticky Group International: Frank Tiano Enterprises, 2460 S.W. 85th Terrace, Davie, FL 33328; Robart, 310 No. 5th St., St. Charles, IL 60174; House of Balsa, 20130 State St., Cerritos, CA 90701.

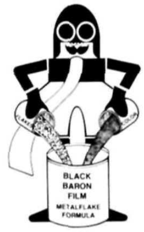
PUTTY & GLAZE

Spot Putty & Glaze from Loctite (4450 Cranwood Court, Cleveland, OH 44128) is an excellent product for filling small dings, cracks and imperfections on any model that has a treated surface. It works best on a primered or resined surface and spreads easily to a feather edge. The satin spread formula dries quickly and is extremely easy to sand. It is compatible with most finishing products and has been used by fiberglass body men in the automotive industry for years.

ASW 17 ROYAL

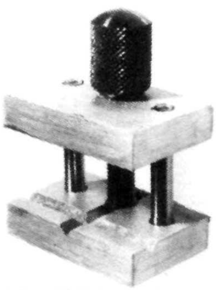
The semi-scale, 13-foot model of the famous high-performance glider from Schleicher, Germany is equipped with ailerons, flaps, and spoilers; suitable for slope and thermal soaring, tow-launching, and aerobatics. This model took first place at the electric world championship in Lommel, Belgium in 1986 in its electric conversion. The fuselage has incorporated tail fin and cabin base, pre-drilled for fast assembly; clear canopy, cockpit interior and pilot figure; balsa pre-sheeted and sanded Siros Expert foam wings and tailplane, incorporated wing ribs; cable tunnels and servo wells in wing panels, flat steel wing mounts; and more.

From Robbe Model Sport (180 Township Line Rd., Belle Mead, NJ 08502).



METALFLAKES COMING!

Coverite (420 Babylon Rd., Horsham, PA 19044) is expanding its popular new Black Baron Film line to include real, honest-to-goodness metal flakes—red, blue and silver—that actually look like they were painted in a custom auto shop. The flakes are imbedded below the surface, allowing the depth of shine associated with metalflake paint jobs. The flakes are very small, in scale for model planes. Hobbyists at the WRAMS Show (February 20-22) were invited to examine the finish in sunlight, and all applauded.



PRECISION MINI-VISE

This new product is based on a simple yet practical design quality-made with a fine detail to its finish. The 5/16-inch-thick 1x1½-inch brass jaws offer a gentle yet positive grip on those difficult-to-hold small parts. The movable jaw has V-grooves for holding rounds and can be reversed. The vise jaws open to 9/16 inch and close without any gap. The jaws are guided by hardened and ground pins for smooth travel. From Armando Cimino (41 Fenley St., Revere, MA 02151).

R/C NEWS

(Continued from page 107)

Make no mistake, this one is very special and includes a spectacular airshow featuring war birds, Byron's new and enlarged Striking Back, flights of Byron's spectacular B-29, the Christen Eagles and much, much more.

Ida Grove will be easy to find from August 12 to 16, with 30,000 fascinated spectators present.

The Tournament of Champions will be reactivated on November 9 to 13 in Las Vegas. This meet, which has changed the face of aerobatic R/C flying for all time, is once again under the sponsorship of Bill Bennett and Circus Circus Enterprises.

The 9th running of this affair (a $100,000 purse adds to the glitter) will be held at the R/C Model Airfield in North Las Vegas Regional Park and will feature contestants selected on the basis of world class performance. A must-see event.

Art Schroeder, c/o *Model Airplane News*, 632 Danbury Rd., Wilton, CT 06897. ■

FLOAT FLYING

(Continued from page 48)

By the way, tapered pads cut from cedar shingles are very handy for minor adjustments.

After determining the incidence relationship between the floats and the plane, the next area of concern is establishing the distance between the floats and the fuselage. The primary objective is to keep the prop out of the spray created by the floats. Experience has shown that a distance of 2 inches between the bottom of the prop arc and the top of the float decks will give adequate clearance on a .20-size floatplane in the worst wind and surface conditions. Because the distance between the bottom prop arc and the water automatically increases as you move into larger models (with correspondingly deeper float sections) it's not necessary to increase prop arc to deck clearance beyond 2 inches. Floatplanes that are set up too "tall" tend to porpoise, because the moment between engine thrust and float drag is increased, which can produce oscillation that cannot be controlled with elevator.

The last steps in the setup process are to position the floats directly opposite one another to balance drag, and to provide a spread between the float centerlines of 25% of the plane's wingspan to insure stability. Both low and high aspect ratio wings cannot use the above formula for obvious reasons, but a good starting point can be arrived at by using the spread utilized for wheeled gear in the engine size range you're flying.

Because of all the interrelated conditions involved in hanging a set of floats, it's a good idea to block everything up on a flat surface with reference lines drawn on that surface. Block up the floats first, the decks parallel to the tabletop, then support the plane over the floats (centered) with the plane's center of gravity directly over, or slightly ahead of, the float step. With all the major components so aligned and the wings leveled, it's an easy matter to measure for strut lengths and come up with a perfect job every time. As mentioned earlier, standard aluminum or composite gear blanks usually make good struts, and because of the wide mount area they typically employ, the need for N-struts is eliminated, reducing complexity on a fist effort.

With the exception of the already overburdened types, almost any model aircraft can be adapted to floats. Engine size is usually not an issue as long as you've built light or are flying the mid to top range of displacement recommended. Most models will benefit from additional air rudder area when equipped with floats, and water rudders are a necessity in all but the calmest conditions. A 25% maximum increase in air rudder/fin area will do the job. The additional area is needed primarily for stability, so a fixed fin under the fuselage, sub fins on the horizontal stabilizer, or even fins on the floats will suffice. For reference on water rudders, a pair 1x1¼-inches each will steer a .20-size, and a pair 2x2¼-inches will handle ⅓-scale planes. Sizes in between can be extrapolated from the above. The water rudders can be controlled by a variety of methods, and it seems to be an area where a modeler's individuality and ingenuity really shows. Just be sure your linkage system operates freely.

Waterproofing an airframe for float use shouldn't take more than one evening. The battery should be wrapped in a baggie. The receiver and servos don't really need protection if they're mounted in the center fuselage area. Splashguards for pushrod exits can be bent from .015-inch celluloid and Hot-Stuffed to the covering. On models covered with film, it's wise to seal overlaps and edges with a coat of clear polyurethane. If you're building a floatplane from scratch, consider painting the frame with Balsarite before covering and putting on a coat of polyurethane in the radio and tank bays.

Operating a floatplane requires extra attention in two areas. It's important to set your engine so it idles reliably, since floatplanes maneuver best at slow speeds. In addition, because the water area usually represents the entire flying site, the inclination is to just land anywhere and throttle around before taxiing back.

Also, it's mandatory to service your plane immediately after a spill. Get the water out of the plane first, wring out the foam packing, then flush the engine with fresh fuel and run it about 10 minutes. Floatplanes are seldom damaged in a spill and you can usually be flying again in a half hour.

With their inherently higher wing loadings, floatplanes need to be brought in a little faster when landing, but this is compensated for by the larger landing areas available and the excellent wing stability and ground effect found over water. The added stability is a real bonus when taking off. In-flight maneuvers are forgiving (which makes you look like a pro), top speed is down by about 10%, and vertical performance is affected. However, the added versatility of high-speed taxiing, splash and go's, and the overall reduction of wear and tear on the airplane more than make up for the slight loss of performance. In addition, if you're a good pilot, you can put a tuned .90 burning 40% nitro in a 60-inch Schneider Trophy Racer and satisfy all the wild urges you may have.

As a footnote, I think it's important to emphasize that both equipping and operating model floatplanes is not a difficult task. Building and hanging a set of floats seldom takes more time than constructing a fuselage, and the payback is well beyond the investment.

Flying a floatplane is a very rewarding experience. This may be a personal bias, but with the surroundings, the difference, the challenge, and the personal satisfaction derived, I think that one would be hard pressed to find a better expression of the sport of model aviation. There's only

FLOAT FLYING

one condition to all of this: if you try it and like it, you have to tell a friend.

**The following are the addresses of the companies mentioned in this article:*

Balsa USA, P.O. Box 164, Marinette, WI 54143.

Proctor Enterprises, 25450 N.E. Eilers Rd., Aurora, OR 97002.

Bridi Aircraft Designs, Inc., 23625 Pineforest La., Harbor City, CA 90710.

Sig Manufacturing Co, Inc., 401 S. Front St., Montezuma, IA 50171.

Top Flite Models, 2635 S. Wabash Ave., Chicago, IL 60616.

Tower Hobbies, 1608 Interstate Dr., P.O. Box 778, Champaign, IL 61820.

Hobby Shack, 18480 Bandilier Circle, Fountain Valley, CA 92728. ■

FORWARD FLIGHT

(Continued from page 58)

to circulate back through the rotor, killing its lift.

For pilots who have never had any fixed-wing experience and do not have an experienced pilot to help them, I recommend a different way to begin and end the first flights. Start the flight by hovering in a circle around yourself. Slowly increase the size and the altitude of the circle. Once a safe altitude is reached, fly the machine as described above. When it comes time to land, start flying the circle again, making it smaller, lower, and slower until the helicopter is back in a hover.

Now that the first flights are over, the top-end pitch should be readjusted for a good climb without overloading the engine and the bottom end pitch for a smooth descent.

Keep practicing and soon you will be burning up the sky.

Good luck with your helicopters. Keep them flying and keep them safe. ■

CLEARLAKE

(Continued from page 23)

in this meet, then the dedication of the Clearlake Club, the prizes they gathered together, and the delicious Saturday night barbeque hosted by the Lions Club and attended by close to two-hundred modelers and their families had to be the icing on that cake. First prize in the pilot's drawing was a four-stroke Saito 120 donated by the Clearlake Modelers and there were eighty more prizes in that drawing (I actually won something this time). First prize in the raffle was a five-channel radio with a North Star Delta Seaplane and a Royal .45 engine. Even the third prize included a .20-size kit and engine.

The number of pilots and the mass of spectators this event draws makes it one of the top fun-flys in the country, and the fact that we're talking about floatplanes with their added complexity makes it all the more remarkable. This is not an easy meet to stage. For example, the lake bottom belongs to the State of California, the surface belongs to Lake County, the docks and piers belong to the City of Lakeport, the ramps leading up to the water are under the jurisdiction of the Highway Department, and they *all* require proof of insurance and activity descriptions.

A special note of thanks goes out to all fifty Clearlake Modelers, to Ray Carman, Art Young, CD Bill Gresham, and to Wally Rinkler, Bill Hershey, and Mo Curry of the Renegades Float contingent. These are a fantastic bunch of hard-working guys who labored five months to give modeling one of its best meets ever, and the only thanks they really want is for everyone to keep coming back. Next year's float-fly is scheduled for the second weekend in May, and I've already made my reservations. ■

FIESTA

(Continued from page 78)

abruptly. No damage except to ego! After changing the trim, the second hand-launch produced a long, flat glide.

It was now time for the moment of truth! I stepped up to the winch, hooked up, took a slow, deep breath, stepped on the pedal, and away went my Fiesta SF. Straight out and steady in a somewhat shallow climb. No additional trim changes were needed and the Fiesta SF soared away majestically. The recommended tow hook position is too far forward and can be moved back a little at a time until it suits your style of launch. Subsequent flights produced higher launches, and with a slight zoom at the end, additional altitude was easily gained. Additional flights yielded longer flight items and smoother control as I became familiar with the Fiesta SF's flight characteristics.

This sailplane has a surprising speed range. It will fly as slow as most floaters but it only takes a small amount of down-trim to cover a lot of territory very quickly. Glide path control is very good with optional Multiplex spoilers as they produce a nose-down attitude that is steady and completely controllable. The L/D on this model is so good that I don't think I would want to try to land without the spoilers. Roll response with coupled aileron and rudder is very quick for a model with a 128-inch span and there is no tendency to tip stall even in very tight turns. Due to its rearward CG, the model is a bit more sensitive to pitch and takes a bit of time to get used to. Because of its flat-bottom-stab airfoil, it is advisable to avoid high-speed dives. As speed increases, the stab produces more lift and tends to push the nose down even more. If the speed is allowed to build up too much, it can cause the nose to tuck under. It would be advisable to avoid this situation and to learn to use the spoilers for rapid descent.

The Fiesta SF is a majestic aircraft that delivers in the flying department. Because of its price, it's not for the average enthusiast, but the serious "glider guider" can expect some serious performance.

**The following are the addresses of the companies mentioned in this article:*

Hobby Lobby International, 5614 Franklin Pike Circle, P.O. Box 285, Brentwood, TN 37027.

Hobby Shack, 18480 Bandilier Circle, Fountain Valley, CA 92728.

Top Flite Models, 2635 S. Wabash Ave., Chicago, IL 60616.

Pactra (Plasti-Kote), 410 N. Michigan Ave., Rm. 1280, Chicago, IL 60611. ■

DIABOLO

(Continued from page 66)

bit more conservative (not much!), I opted for the O.S. .40 FSR with a stock muffler. The installation was a piece of cake; only Brother Chianelli might have had difficulty: to him an engine installation is a Navajo military base!

The motor mount comes pre-installed but I would suggest removing the mounting screws and adding either lock washers or Loctite before reinstalling. After some fifteen flights, the engine sounded funny. I landed, to discover that three of the four screws were gone and the one remaining, loose. Guess what's now on my pre-flight inspection check list....

Guidance for this critter is provided by the new Aristocraft 720 FM Challenger system, which is, to my way of thinking, highly underrated. It's got bells, whistles, chimes and everything the sport flyer could want, except, perhaps, easy to understand operating instructions. My system came with three servos (I added the fourth for $11) and dry batteries. That, my friends, says you can buy a full feature, including mixing, servo reversing, dual-rate, seven-channel FM system with four servos for around $140! Polk's has also got XMTR/RCVR Ni-Cd packs and charger available for those of you who want such niceties. This system is a bargain! There's plenty of room for all the airborne components in spite of the mid-wing placement on the Diabolo.

At this point, I made a few other changes which were a matter of personal preference or convenience rather than necessity....

1. The Control horns were replaced by conventional-type assemblies. The attachment area was reinforced with sheet plastic and the screw holes bushed with brass tubing.

2. The method of attaching the vacuum-formed, over-the-wing fairing/cockpit was changed from four screws to Velcro. This fairing must be removed to gain access to the wing bolts, which means every time you go to the field unless your Diabolo isn't disassembled for transport. Dubro* has a hook-and-loop-type material which works fine.

3. External braces, made from aluminum tubing and dowel, were installed between the lower stab surface and the fuselage side. Stiffens things up considerably.... I've broken similar stabs doing some "violent" aerobatics.

4. The rear edge of the blow-molded cowl was cut back to provide a cleaner installation.

5. All of the taped edges (wing/fin/stab) were treated to sealing application of ZAP along the edge. My experience has been that the tape adhesive, in time, succumbs to the attack of fuel and oil.

Your Diabolo should now be ready for final checkout prior to launch. A couple of extra minutes spent here will usually eliminate grief at the field. With the airplane fully assembled, check the CG, which should be right at the leading edge cutout. I had to add 3 ounces to the nose. There are conveniently marked locations on the fuselage. Slightly nose-down is ideal. Check the control surface throw direction. A handy little device to measure throw is available from Robart*; it's called SDI (Surface Deflection Indicator) and it works really well. Adjust the linkages to get the recommended throws and you should be all set.

FLYING. The Diabolo is a pleasure to fly. The O.S. .40 FSR is an ideal-size powerplant as it will haul the 5-pound machine around with authority. It seems most happy with a 10x6 prop and 10% nitro fuel. I suppose you could stuff a .60 two-cycle in and gain some vertical performance but I think that would be a bit of overkill. A .60 four-stroke might just be the perfect engine for a happy blend of straight and level and climb performance.

This airplane is definitely not a trainer as, once it's trimmed out, it is neutrally stable and doesn't do much unless commanded, and that includes self-recovery characteristics! The guy who's comfortable with a sport pattern airplane will love this one. It rolls very axially, knife-edges well within reasonable top rudder and lands gently, very gently!

Look into this one.

**The following are the addresses of the companies mentioned in this article:*

Polk's Model Craft Hobbies Inc., 346 Bergen Ave., Jersey City, NJ 07304.

Great Planes Model Distributors, P.O. Box 4021, Champaign, IL 61820.

DuBro Products, 480 Bonner Rd., Wauconda, IL 60084.

Robart Manufacturing, 310 N. 5th St., St. Charles, IL 60174. ■

STEP-UP

(Continued from page 27)

cable assembly is secured to the float with two 3/32 hold-downs. Rubber bands are laid under the hold-downs along with the cable to make a slip joint for rudder adjustment. The bend is wired to the left down-strut. Control surface throws should be: aileron, 3/8 inch up and down; elevator, 1/2 inch each way; and rudder, 5/8 inch. Be sure the engine servo will produce idle shut-off at low trim. The final CG should come out at 28% with tank empty.

I'm going to assume the pilot has at least one seaplane under his belt so I'll just say, keep it's nose up on takeoff and hang on tight. With the large elevator and a little power you can drag it in. Don't worry about tip-stalling; this machine has no nasty habits. One last note: if you want

STEP-UP

to install a FSR instead of a FP, go for it! But take out the down-thrust.

**The following are the addresses of the companies mentioned in this article:*

MonoKote: Top Flite Models, 2635 S. Wabash Ave., Chicago, IL 60616.

Mica Film: Coverite, 420 Babylon Rd., Horsham, PA 19044.

Lake Enterprises, 137 North Pacific St., Suite D, San Marcos, CA 92069. ■

RUFE MODS

(Continued from page 29)

fillets with 1/64-inch plywood forward and some built-up pieces aft, and lots of Magic Filler.

The Top Flite wing is more a A6M5 so put the tips back on as shown on the modification drawing. The WI-A ribs are spread by the width of the float crutch so remember to put a temporary spacer during assembly and take it out after the wing is sheeted. The aluminum rear V-strut is epoxied to W-18 prior to sheeting also. Check out the kit-supplied bell cranks; if they're too sloppy, replace them with some tight ones.

The main float is partially sheeted while one side is still attached to the building board. It is then removed, the other half bulkheads attached, chines applied, and the second side sheeted. The front crutch consists of the pieces of 1/8-inch plywood sandwiching a 3/16-inch piece of balsa. At the wing, this combination fits over the spar and between wing ribs WI-A.

At the float, the 3/16-inch sheet is short so the two 1/8-inch sides slip over the float crutch and around the bulkhead 4. The two check blocks are carved to fair the structure to near scale. Remember to install the float servo extension in a slot in the 3/16-inch center sheet. This crutch, the rear V-strut halves, and the water rudder servo assembly are all secured from the bottom.

(Incidentally, I precontoured my sheeting by wrapping the damp sheet around any appropriate diameter tube, securing it, and then pouring ammonia over it. You get a much nicer job.)

When the equipment is installed and you're satisfied that the servo actuates the water rudder in the same direction as the air rudder, sheet the bottom and attach and carve the nose block.

I built my tip floats the hard way. I sawed a series of 1/2-inch crossgrain blocks and ball-pointed the appropriate right and left bulkhead patterns on them. I cut the blocks just outside of the lines and Sig-Mented them to the keel piece. Carving and sanding to the penned lines gives a pretty nice float. I carefully separated the blocks and hollowed out the insides. Leaving a space in the keel for the down-strut stub, the blocks were all glued back together and given a final sanding. The outer aluminum stub struts were permanently epoxied in the float with a little extra epoxy at the bottom to insure that the stubs were watertight. Stub struts were also installed 12 inches from the tip wings and just touching the back of the wing spar. Be sure during this operation that the down-struts are installed for alignment. Except for display, the down-struts are guyed both to the wing leading edge and to the spar on either side with stranded control-line wire. I soldered small brass clips to the wire, after it was slipped through holes in the down-struts so they could be secured with small sheet-metal screws.

My ship is covered with dope-and-filled silkspan. In addition, the keel area of the float has a 2-inch strip of 1-ounce glass for additional strength. The Rufe came in the classic green, and all-grey versions, both with black cowls. I chose the green and grey model; the grey is Rust-oleum auto primer grey. To get the green, I matched the Federal Standard with a 3 1/2-ounce jar of Formula U jungle green, a 3 1/2-ounce jar of light blue, and two tablespoons of bright red. The kit insignias will work only if applied over white. I ended up painting the wing Hinomarus and using the kit-supplied items over white on the fuselage. The tail stripes are red-over-white with the numbers cut from the remaining Hinomarus.

After India-inking the major panel lines, the whole ship was sprayed with satin polyurethane. Top Flite doesn't supply the cowl with gun troughs, or the lower carb air intake. I fabricated a balsa air intake. The gun troughs were made by cutting a piece of 5/8-inch-OD hot-water PVC in half, contouring the fronts to match the inside of the cowl, and gluing them to the inside with PVC glue. Additional tape was glued around the tubes for strength. The outsides were carefully cut through and sanded smooth. The cowling was sprayed with Rust-oleum flat black. To balance the ship, lay whatever weight is necessary on the tip of the float. Cut the float tip off, hollow it out, and put an equal amount of weight in the float tip. Put the tip back on with Epoxy Lite and be sure sure it's watertight.

FLYING. My HB 61 has about 2° right thrust when I fly a 13x5 prop. If you do it right, your Rufe should weigh about 9 pounds. You'll find, however, that when power is applied it will jump up on the step like a lightweight. Just a touch of aft stick will fly it off the water. Ten degrees flaps will cut the take-off run a bit but the flaps really show up on landing. Twenty degrees flaps on downwind and full flaps on final; you won't see a trim change other than some initial ballooning if they're dropped at too high an airspeed.

If you decide to build a Rufe and have any questions at all, I'll be glad to assist you in any way I can.

Ed Westwood, c/o *Model Airplane News*, 632 Danbury Rd., Wilton, CT 06897.

**The following is the address of the company mentioned in this article:*

Top Flite Models, 2635 Washash Ave., Chicago, IL 60616. ■

HELICOPTER

(Continued from page 55)

turers will supply a reverse servo with the set or offer a reverse servo for each one of the various servos in their line. With the popularity of servo reversing, however, some of the newer radio systems will not offer a reverse servo, as the chance for this being needed is remote. If you can't get a reverse servo, and you really need one to make your system operate, the following instructions will cover the reversing of servo direction. Let me state that performing the following steps on any servo will void the manufacturer's warranty, and are only to be performed by a person who has some experience soldering small electrical connections. Don't attempt reversing the servo yourself unless all other options have been exhausted. To reverse any servo, follow these steps:

1. Wrap the servo case with Scotch tape around the seam where the top case and center case come together. This will prevent the case from falling off and spilling the gear train, as this can be very difficult to re-assemble.
2. Remove the four case screws and the case bottom.
3. Gently pull the circuit board away to expose the motor and servo pot. Be careful not to pull out any wires.
4. De-solder and exchange the two outer wires to the pot. Be sure to use rosin core solder only, as acid core solder will corrode the joint after a period of time.
5. De-solder and exchange the two wires to the motor.
6. Re-check all solder joints carefully and re-assemble the servo.
7. Check the servo for proper operation, and replace it in the model.

Once again, don't attempt this procedure unless you absolutely must, and have the necessary experience.

Now that we have checked over the assembly of the helicopter and have the gyro operating in the proper direction, it's time to prepare the helicopter for its first flight. Before you pack your stuff up and head to the flying field, you should make yourself a list of items to take with you. The list should include the helicopter, the transmitter, fuel, fuel pump, starting battery, electric starter, glowplug igniter, training gear, tools (most of the hand tools that you used to assemble the model should accompany you to the field in the event that something needs to be disassembled and repaired). You might also consider a small card table to set your helicopter on at the field.Go over this list before you leave for the field, so as to not waste time backtracking if you've forgotten something.

Next month I'll go into the pre-flight checklist.

Craig Hath, c/o *Model Airplane News*, 632 Danbury Rd., Wilton, CT 06897. ■

SMALL STEPS

(Continued from page 18)

R/C equipment for our small, lightweight airplanes. There are so many systems on the market now that it's confusing: AM and FM and PCM; two-channel cheap rigs and eight-channel super-systems.... I get quite a few letters asking, "What kind of a radio outfit should I buy for school-yard flying?"

My recommendations are simple. For models powered by bigger engines than .049s, I recommend Ace R/C's* Silver Seven system with Bantam Midget servos and a 450-550 mAh battery pack. And for the really small airplanes, there's nothing to compare with Bill Cannon's* Super Micro equipment.

I have more than one reason for making these particular recommendations. For one thing, these systems are American-made. The Japanese sets are high in quality and very reasonably priced, but they have a major weakness: when you need service, you've got to send them to a special service center for repair. That takes time and money.

A friend of mine had trouble with the rudder channel in his Japanese-made R/C system. I checked it out in my shop and quickly found the problem. The transmitter had a faulty potentiometer (pot). I could have fixed it in a few minutes if I'd had a new pot, but it was non-standard and therefore unavailable from electronic parts suppliers. Worse, the pot housing was molded in place as part of the gimbal assembly. When my friend eventually got his transmitter fixed by an authorized service center he had to pay for a complete replacement gimbal assembly rather than just for the inexpensive pot.

American-made R/C equipment isn't like that. Ace R/C systems in particular are designed specifically to be user-serviceable. Because they are available in kit form as well as fully assembled, they're generally quite easy to work on. Even when you buy an assembled system, you still get the complete kit manual too. Thus you have all the data you need for trouble-shooting, tuning, and even customizing. With Japanese-made stuff you get nothing in the way of technical information and are at the mercy of the service center's technicians.

Cannon's R/C systems aren't available in kit form, but the instructions that come with the sets are almost as complete as if they were intended for a kit builder. Cannon even tells you how to clean and adjust the servos.

Especially valuable in both the Ace and Cannon instructions is the tuning information. Of course, FCC rules prevent you from doing anything to the transmitter's RF circuit; but you can tune the receiver to match your transmitter precisely. This requires no special, expensive equipment.

True, both Cannon and Ace mention using an oscilloscope for receiver tuning. But they also tell you how to do the job with an inexpensive milli-ammeter. I own a good scope—but I've found I can tune my receivers more easily and accurately with a meter. The one I use is a Radio Shack Archerkit multimeter ($15).

The ability to customize my R/C equipment is important to me, mainly because of the way I fly. I'm a single-stick pilot. I do a lot of my flying alone, from grassy fields where hand-launching is the only way of getting airborne. That's why I've

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SMALL STEPS

(Continued from page 123)

added a strap handle to the left side of all my transmitters and relocated the throttle control just to the left of the stick. With this lashup I can hold the transmitter securely in my left hand while I launch my model from my right. If throttle manipulation is needed, I can easily do it with my left thumb.

I've found the ease of customizing Ace and Cannon transmitters a big plus in their favor, but the airborne components of their systems are where they really excel for my style of R/C modeling.

Ace's Silver Seven receiver is small and light; so are the Bantam Midget servos. But for sheer "tininess" and featherweight installations, there is nothing like the Cannon Super Micro stuff. A complete three-channel airborne package weighs less than 4 ounces! And it's so small it will fit in just about anywhere you'd ever want to use it.

Cannon R/C Systems is the official importer of the G-Mark line of model engines. Their .061 and .030 are the most responsive to throttle control of any of the tiny R/C motors.

The little G-mark .030 is an especially attractive design, with a built-on fuel tank that will run the engine for almost 6 minutes. However, I should mention two things about this motor that I've found to be important. First, the propeller that comes with it is far too small for powering an R/C airplane. Assuming that you put the .030 in a model with from 140 to 200 square inches wing area, a 6-3 prop is best.

Second, the G-Mark engines are fitted in the old-fashioned way, which I like: they're snug when new and need a careful, prolonged break-in before they're ready to fly an airplane with. My experience has shown that an hour or so of rich-running is needed before a G-Mark is really right.

This should present no problem. G-Marks drink little fuel per minute, even set blubbering rich. And they come with very effective mufflers, so the neighbors won't be outraged by the noise of the break-in process.

Remember to keep writing with questions, suggestions, comments, and criticisms (with a SASE) and I'll be glad to send you a personal reply.

**The following are the addresses of the companies mentioned in this article:*

Ace R/C Inc., Box 511C, Higginsville, MO 64037.

Cannon R/C Systems, 13400-30 Saticoy St., North Hollywood, CA 91605. ■

FLOATING

(Continued from page 81)

floats down on the nails with the tops up. Cut out the 6-ounce cloth and smooth it over the suspended cores leaving selvedge around the edges. Wet out the cloth with a 1-inch brush and strike off the excess with a broad putty knife or an old credit card. After curing, pull the floats off the nails, trim the edges, set the floats upside down on top of the nail heads and glass the bottoms, using four pieces of cloth for the stern, step, and two flats. After the bottoms cure, trim again and mix more epoxy, but this time add about 30% microballoons to the resin for the filler coat. After the filler coat is struck off and cured, sand the glassed floats with a block (this part is easy because of the flats)

FLOATING

starting with 80-grit and finishing with 120.

Any design or method has to be judged on five major points: ease of construction, material cost, durability, appearance, and performance. The availability of 5-to-1 epoxy systems gives the float modeler the option to consider a float system that eliminates the complexity, waterproofing problems, and delamination potential inherent in built-up and sheeted-core floats. Familiarity with the building process is also important, and I hope the above information will be useful. One note of caution seems in order here: the table saw passes made to form the top chines aren't your normal garden variety cuts. Keep an eye on the top of the blade as it passes through the foam and please be careful!

Understandably, this is a very special issue for anyone involved in, or contemplating, the sport of float flying and I wish to thank *Model Airplane News* for the opportunity to present a regular column and extra coverage on the subject of floatplanes. Next time around we'll hear from Ed Westwood in Spanway, Washington, and take a look at a Gull Wing floatplane by George Graff.

John Sullivan, c/o *Model Airplane News*, 632 Danbury Rd., Wilton, CT 06897.

**The following is the address of the company mentioned in this article:*

PIC, Penn International Chemicals, 943 Stierlin Rd., Mountain View, CA 94043. ■

FROM COCKPIT

(Continued from page 73)

industry. In those days airplanes were still tube and fabric with very few pioneers venturing into aluminum airplanes, Earl Osborn among the few.

The first airplane to ride aboard a set of aluminum floats was a WACO 9 in 1926. It took only a few years for EDO's new floats to creep up under everything that flew, in every corner of the globe. In those days if it flew, it eventually strapped on a pair of EDOs and took off for parts unknown. Although there have been numerous competitors to the EDO domination of the field, today, 60 years later, the vast majority of airplanes using floats are still mounted on EDOs.

Yes, Earl Osborn and EDO were the cornerstones of float aviation but it was the need for transportation to out-of-the-way locations that got the industry off on a nearly explosive start. By the early 1930s, not only were Canada and South America trying to develop and explore their backwoods, but numerous manufacturers had begun to build airplanes which would make tremendous transports, if they could be guaranteed a place to land when they got to where they were going. Certainly one thing most underdeveloped countries had was lots of lakes and it took no time at all before EDO and the bush pilots became a inseparable combination. Even today, as you tour the river and lakes of the Canadian and Alaskan wilderness, you'll find some of the strangest combinations of airplanes and floats ever. Sure, there will be lots of Cessna 180s and 206s and an abundance of Super Cubs, but you'll also run across Norduyn Norsemans and D.H. Beavers, Piper Aztecs (which would look more at home carrying executives around rather than pilots and passengers in ski parkas) and, although they are disappearing, the old model 18 Twin Beech, a cargo-hauling favorite on floats. And the list goes on.

The north woods is beginning to lose a lot of its anachronistic haulers like the old Bellanca Skyrockets and Norsemans, but periodically we'll still hear of a museum or antique collector discovering a thought-to-be extinct bird with webbed feet on the edge of some remote lake.

The unlimited runway concept that is part of float flying didn't escape the military on either side of the battle lines. Both sides tried bizarre combinations of floats and military/combat birds. Japan had entire squadrons of float-equipped Zeros (called Rufes), liaison and other special-use birds that ranged from little transports to Raggedy Ann biplanes. Germany saw fit to put at least one of just about everything they owned on floats and England even tried a Grumman Wildcat (Martlet in English) on floats.

Back in America, our biggest float-bound effort was putting a C-47 Gooney Bird up on a pair of enormous EDOs that displaced 29,400 pounds of water *each!* These monsters stood 5 feet tall and nearly 40 feet long. A total of ten airplanes were reportedly so equipped. At least one set of the floats survived and is currently in Maine with a group of aviation enthusiasts who are busily occupied manufacturing the attachment fittings to mount them under their DC-3.

Like we said, as a modeler there are no limitations to what can be legitimately mounted on floats. From tiny little Nieuports to Ford Tri Motors; obscure Junkers to well-known fighters, it's all been tried by somebody, which means you can try it too. So have at it and have fun. ■

Club of the Month

One of the oldest, organized radio-control clubs in America is the Chicagoland group, also the oldest and largest R/C club in the windy city. This club was started in 1948 and has included many famous names in its membership over these nearly forty years.

The club publishes a fine newsletter appropriately dubbed, *Windy City Newsletter.* This publication epitomizes advanced club newsletters with many pages and departments, news of other clubs, safety, shop tips, AMA news, and various how-to articles. Editor Lee Parlow and publisher Chuck Bullis can be proud of this newsletter, as can all Chicagolanders.

Chicagoland is clearly an active club with a variety of upcoming events to keep its members' interest at a peak. There's a banquet, an auction, a large scale contest, and the inevitable fun-fly.

The club has been experiencing some radio interference problems, and Joel Hodroff recently used a spectrum analyzer to track it down—not a bad idea for all clubs. There are a number of transmitting towers around the field, so care must be taken.

If an award were given for best club emblems, Chicagoland would be at or near the top of any list. While its flying radio tube may be obsolete in this solid-state age, we hope they never change—it's a cutie!

Model Airplane News applauds the Chicagoland RC Club and is pleased to award two free one-year subscriptions to be given by them to worthy members.

Each month Model Airplane News will select the club newsletter that best shows the club's activities and energies directed toward the furtherance of the hobby. The award is not based on size or quality of the newsletter, and can be about any aspect of the hobby (F/F, C/L, R/C, boating, cars, etc.). Model Airplane News will award two free one-year subscriptions to be given by the club to outstanding members. So send your newsletter to Model Airplane News, Club of the Month Contest, 632 Danbury Rd., Wilton, CT 06897.

CONTROL TOWER

(Continued from page 16)

the user's desired feel. The throttle control is detented and both rudder and throttle have electronic trims, rather than mechanical. The rudder trim is at the bottom under the stick bezel and the throttle trim is at the right of the stick bezel. In the center of the transmitter we have a neck strap bracket and under it is the On/Off switch; up is On, down is Off. Incidentally, a neck strap is provided as an accessory. Continuing to the right is the elevator-aileron adjustable stick with electronic trims, elevator trim to the left and aileron below the stick. On the lower right side of the transmitter (as viewed from the front) is the transmitter charging jack.

Moving to the transmitter rear side at the upper left is an access cover to the transmitter crystal. To remove the crystal, pop off the cover and remove the crystal by its tab. Remember, if you change frequency, both receiver and transmitter crystals must be changed. At the bottom rear is a removable battery cover, which slides down to reveal the battery pack and servo-reversing switches. You can remove the pack by lifting the right end toward you. Tightly fitting spring clips are used to connect the battery to the transmitter electronics so there is no soldering to connect a new battery, a nice feature. Located above the pack are the five servo-reversing switches, left to right they are aileron, elevator, throttle, rudder, and landing gear. Normal is left position, reverse to right.

To adjust the spring tension on rudder, aileron, or elevator, remove the back cover by unscrewing the four Phillips-head corner screws, which will reveal two PC boards. The one to the left is the RF board and to the right is the encoder. They are joined by a 5-pin connector at the lower common side of each board. To expose the aileron-rudder adjustment screws, the RF board must be disconnected by gently pulling it to the left. Only the connector holds it in place when the back is off. With the elevator-aileron stick mechanics in view, the two upper left Phillips-head screws are for adjustment, elevator to left and aileron to right. For rudder adjustment, note the two 3/16-inch diameter holes about one-third up the decoder board on the right side. The rudder adjustment screw is under the left hole. For all stick adjustments, clockwise movement makes the feel softer, counterclockwise stiffer.

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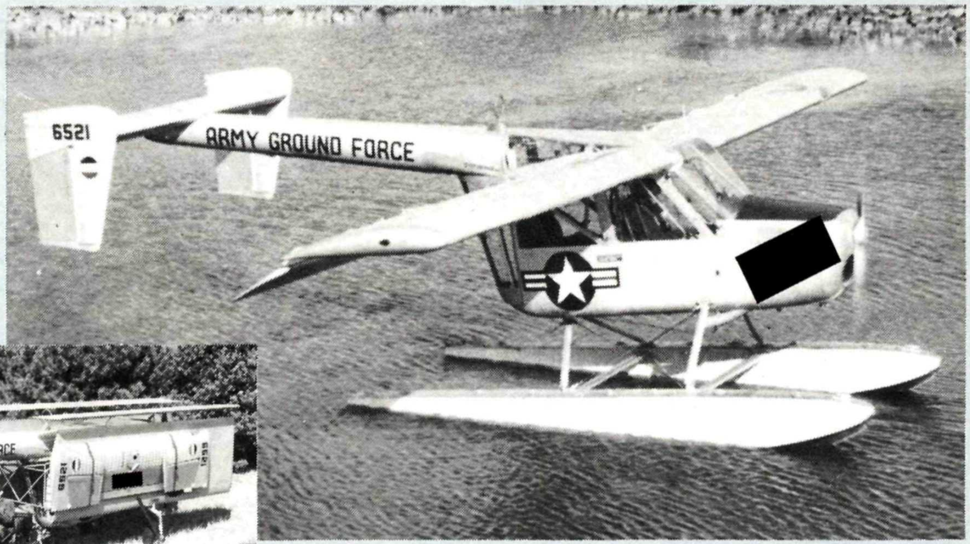
NAME THE PLANE CONTEST

Can you identify this aircraft?

If so, send your answer to Model Airplane News, Name the Plane Contest (state issue in which plane appeared), 632 Danbury Rd., Wilton, CT 06897.



Hands-off flying in the Firestone XR-9B is, according to Firestone, as easy to do in this tandem commercial version of the (G&A) XR-A (single-seat) as it is on a bicycle. The spacious Loctite-enclosed cabin provides 270° range of vision. Dual controls facilitates training of students.

Congratulations to Jennifer B. Hopper of Yuma, Arizona, for correctly identifying the July mystery plane. Other correct entries came from Joseph A. Zinno of Federal Way, Washington, and Earl Lock of Tallmadge, Ohio.

The winner will be drawn four weeks following publication from correct answers received by postcard delivered by U.S. Mail and will receive a free one-year subscription to Model Airplane News. If already a subscriber, the winner will receive a free one-year extension of his subscription.

CONTROL TOWER

(Continued from page 127)

Moving on to the receiver, the first thing that struck me was its size. It measures only 1.38x1.98x0.81 inches and contains receiver, decoder, and a 5-plug receptacle. Cirrus advertises that the receiver has a 20KH channel spacing; however, only one crystal is evident, which indicates single conversion to 455K IF, so some additional filtering is being done. Lacking a schematic, I called Hobby Shack and they indicated that three ceramic filters are employed to provide enhanced signal purity.

The servos employed with the RC-5JKP are the CS-238s with a hefty 49 inch-ounces of torque, plenty for most moderately sized aircraft.

I've included a summary of the salient characteristics of the transmitter, receiver, and servos earlier in this article so that should suffice for performance stats. I would, however, like to talk about the Cirrus RC-5JKP accessories, and there are a bunch. First is the HS-FBC-8B(6) charger. It charges the 9.6V, 500-mAh transmitter battery and the receiver 500-mAh 4.8V battery at 50 mA together or individually.

A unique feature of the charger is the use of just one light emitting diode (LED). First plug the charger into a 110V 60 outlet with nothing connected, then plug in the transmitter jack. Note the LED lights red. When the receiver pack is plugged into the charger, the same LED turns from red to green. If you charge the receiver battery alone, the LED will glow a brighter green than when both receiver and transmitter are charging. Thus, to make sure you are charging both packs, plug in the transmitter first, get a red indication, then the receiver battery and the LED will turn green. After a couple of tries, it's easy. Charging time is nominally 15 hours.

Next is a color-coded frequency flag and antenna mounting holder. A transmitter neck strap is also provided, as are two servo trays, one for three servos plus an On/Off switch and the other for the aileron servo. Lastly, there are a total of two splined horns, two with arms (4 and 6), one wheel of 1⅜-inch diameter with no holes, and finally a switch harness.

I think Hobby Shack has another winner with the Cirrus PCM. It is well made

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CONTROL TOWER

(Continued from page 130)

and packaged, and has many features found in considerably-higher-priced sets. In particular, the gimballed sticks with electronic trim and adjustable feel are not normally available in sets sold at these prices.

Charlie Kenney, c/o *Model Airplane News,* 632 Danbury Rd., Wilton, CT 06897.

**The following is the address of the company mentioned in this article:*

Hobby Shack, 18480 Bandilier Circle, Fountain Valley, CA 92728. ■

GOLDEN AGE

(Continued from page 85)

and flying his modified Astro Hog he was unbeatable in the western meets. Ed Kazmirski had dominated the midwest flying for a couple of years and was quickly way out front in that section. Neither needed Nats points to make the team.

The east was a different story, as Nats time approached several fliers had enough points so that the Nats could make a difference. It was really too bad the Nats were not in the east that year, it could have been a wild time!

At the Nats it was apparent that the east member would be a toss-up between Maynard Hill and myself. Maynard was flying his own-design shoulder-wing using the latest version of the TTPW radio system. I was using my Custom Bipe with Bramco 10-channel reeds. On his next to last flight my landing approach had to be over the adjacent flight line; line separation was not great in those days. As the bipe passed over the adjacent area, I lost radio contact (the signal was blocked by another transmitter) and the Bipe free-flighted into an official's tent. There was some damage to the tail section, but it was repairable if the precise trim wasn't lost in the process. Adjustments were

critical with those reed systems.

At this point Maynard had completed his flights and I had another coming, if I could make it. Remember there was no cyanoacrylate for rapid repair! A check of the point standings showed Maynard ahead, so I would have to top him with my last flight. The flight went well and when the points were totalled I had made the team by just 3 points out of about 100! The team manager was Dr. Walter Good, who was quite familiar with Europe and the FAI. He would prove most valuable on the team.

The timing of the team choice was great, allowing nearly a year to prepare models and practice the unfamiliar FAI schedule. With all the advancements that were the name of the game at the time, choices would be critical if the team was to have the best equipment available.

All three of us team members went to work quickly. Orbit Electronics set about developing a new relayless-superheterodyne reed system which would be a full 8 ounces lighter and ultra reliable, a major advancement. Kazmirski and Dunham would use this in the Champs. It would be the most advanced system flown there. Orbit did not have a single-stick transmitter, so I stayed with my trusty Bramco 8-channel.

At the '58 Nats Dunham had shown the advantages of a low-wing design with his Astro Hog and a modified version had done even better in '59. However, Bud Hartranft had impressed Bob with a much smaller, sleeker, and faster low-wing which Bob knew portrayed the future of R/C pattern. The Voltswagon turned out to be Bob's FAI entry with his vintage Astro as backup. Kas was also impressed and developed a similar design which would become his famous Orion.

My big Custom Bipe had treated me well. With my Bipe experience I thought that a smaller, improved version more adapted to the reliable ST .35 engine would be better, yet I was experimenting with some low-wings. I wanted to stay with what I was used to, so I developed two new specialized bipes, one of which looked good. There also was an excellent low-wing available, a stand-off scale Stits Playboy. I ended up using the Stits with the FAI bipe as backup.

There was no clean-cut engine choice in 1960. The K&B .35 and .45 were popular and ran well most of the time. The .45 showed ample power and Bob and Kaz decided to use them for power. I chose the ST .35 which had proven extremely reliable over a long period of time. For a one-shot attempt you needed to reduce potential problems to a minimum.

When early June came, the team met in Delaware with three huge model boxes, which proved to be no real problem as we were taking an Air Force flight to Germany. Everything went well, including the Zurich arrival. Our Swiss guide moved us quickly through customs to a micro-bus and on to the Dubendorf hotel.

We wanted to test-fly in the Swiss climate because we were concerned about the high altitude. Our Swiss guide led us to the practice field, a roughly mown section of a lush alfalfa pasture. There was no way to take off! It was a good thing that it was just possible to hand-launch these slower (than today's) models. We all got a couple of flights and had no problems.

This seems like a good point to break off this saga until next month. Just don't go away as the intrigue has yet to start!

Hal "Pappy" deBolt, c/o *Model Airplane News,* 632 Danbury Rd., Wilton, CT 06897. ■

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WANTED: Model engines made before 1950. Don Blackburn, P.O. Box 15143, Amarillo, TX 79105; 806-622-1657.

WANTED: Kits (circa '50 and '60s) from Berkeley, Babcock, deBolt, Veco (U/C and R/C), Monogram (Speedee-Bilts), Scientific. Dr. Frank Iacobellis, 19 Highland Park Place, Rye, NY 10580; 914-967-7763.

COLLECT AUTOGRAPHS of aviation pioneers, aces, astronauts, other celebrities. The Autograph Collector's Magazine, P.O. Box 55328, Stockton, CA 95205. $12 year U.S.; Canada, Mexico, $17 foreign.

EXCITING 1/4-SCALE model aircraft plans. Complete, easy-to-follow blue prints, and if you like manufactured accessories to deck out your plane. Send for free literature, P.O. Box 5504, Aloha, OR 97006.

CLEARING OUT OLD MAG ACCUMULATION: *M.A.N., A.T., Flying Models*, and others. Send self-addressed stamped envelope for list. Fruciano, 6146 E. Cactus Wren, Scottsdale, AZ 85253.

TWO McCOY/K&B 21s, complete; one K&B 21 near complete; many additional parts; condition excellent or new—all $125. One Picco P-21 Aero RE, new in box, $50. Nick Sher, 815 Beech Rd., Langhorne, PA 19047.

HOMEMADE FIREWORKS, complete book $4. Gregg's Books, Box 161, Dimmitt, TX 79027.

AIRFOIL DRAFTING SOFTWARE: Airfoils of given chord plotted full-size on printer. IBM and compatibles. High resolution graphics; blends airfoils; calculates all ribs for a wing; more. 50 airfoils on disk; add your own. Disk $25 U.S. or $32 Can. Francois Ayotte, 6217 Robert Blvd., St-Leonard, QC, H1P 1N2, Canada.

ENGINES: IGNITION, GLOW. Collectors, runners, used, new. Sell, trade, buy. SASE for list. Rob Eierman, 504 Las Posas, Ridgecrest, CA 93555; 619-375-5537.

PLANS: Sport MiG 25 Foxbat, built-up balsa, 6-8 pounds, single engine 46 to 77 Turbax or Dynamax. Quick and easy to build, very stable and fast also. Excellent ducted-fan trainer. Template sheet included. $15 and $2 postage and handling. For more information send an SASE to Carl Stronberg, 9950 Eton, Chatsworth, CA 91311.

RAZOR BLADES: Single-edge industrial quality, super sharp. 100/$4.75, 200/$9.50, 300/$14.25, 500/$23.50, 1,000/$46.00; add 10% postage west of the Mississippi. Cobbie's Gifts, Box 2, Deal, NJ 07723; 201-922-9898.

WANTED: RTF U-Control planes from Cox, Wen-Mac, Comet, Aurora, Testors, etc., complete or pieces, buy or trade. John Fietze, P.O. Box 593, Lynbrook, NY 11563.

ANTIQUE MODEL IGNITION ENGINES—PARTS CATALOG, 50 pages, precision cast timers, original cylinder heads, point sets, drive washers, tanks, for GHQ, O&R, O.K., many others. Large catalog $4.00 pp. Chris Rossbach, RD 1, Queensboro Manor, Gloversville, NY 12078.

HARDWARE AND SOCKET HEAD cap screws, all sizes, low prices. Write for complete list. Example 6-32x1" only $4.25 per hundred. Micro Fasteners, P.O. Box 42A, Netcong, NJ 07857.

WANTED: Model airplane engines and model race cars made before 1950. Jim Clem, 1201 E. 10, P.O. Box 524, Sand Springs, OK 74063; 918-245-3649.

BEGINNERS, discouraged by too-fast R/C "trainers"? Send $1 and a stamp for no-holds-barred evaluation of over 20 well-known models rated for their ease-of-flying. James Waterman, 3818 Deerfield Dr., San Antonio, TX 78218.

BOOKS FOR MODELERS. Out-of-print/current, 400+ items list $1. John Roby, 3703B Nassau, San Diego, CA 92115.

SCALE DOCUMENTATION: PLAN ENLARGING. Photo packs, 3-views, drawings for 1,600 aircraft. Super-scale R/C plans for Giant, Sport; 43-page catalog $3. Scale Plans and Photo Service, 3209 Madison Ave., Greensboro, NC 27403; 919-292-5239.

HARRY HIGLEY BOOKS: *There Are No Secrets*—on finishing model aircraft, including paints, adhesives, heat-shrink plastics, shaping, sanding, priming, etc. *Master Modeling*—explains drawing plans, how to scratch-build, use plastics, foam, fiberglass, balsa, and plywood. *Tom's Techniques*—from Tom Ingram, in collaboration with Higley, explains all aspects of finishing a model airplane with iron-on plastic films, step-by-step photos. Special clearance price due to discontinuation of Harry Higley's book line. All books are reduced to $8.95 each (down from $10.95), plus $1.50 postage each. Quantities are limited so act today. *Model Airplane News*, 632 Danbury Rd., Wilton, CT 06897.

ENGINE COLLECTORS: Spark ignition and old diesels for sale. Riccardo Taccani, CP59, 6834 Morbio INF Switzerland.

Send ad and payment to *Model Airplane News*, 632 Danbury Rd., Wilton, CT 06897.

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